ECOLOGICAL LAND CLASSIFICATION

OF

BEAUVAIS LAKE PROVINICAL PARK STUDY AREA

Alberta
ENVIRONMENT

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BEAUVAIS LAKE PROVINCIAL PARK STUDY AREA

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for

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DISCLAIMER

Evaluation of the status of flora and fauna in the study area is based on 1996 definitions and categorized lists of species of concern (ANHIC 1996, COSEWIC 1996 and Alberta Environmental Protection 1996). However, these lists are periodically updated, based on new information or a change in status. For example, some species which were considered relatively secure may now be included in more current lists of species of concern. The information collected during this study was recorded on field plot forms which are stored at Alberta Resource Data Division offices in Edmonton. These data need to be reviewed and re-evaluated in light of possible changes in the recognized status of species.

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1.0 INTRODUCTION

Beauvais Lake Provincial Park is situated in the foothills of southwest Alberta. The topography varies from densely forested hills to steep grassy ridges and gently undulating meadows. The abundance and outstanding diversity of natural resource features, and the flora and fauna which are representative of the Montane Natural Subregion, are what make this area important in the province's protected areas system.

In order to gather baseline information useful in the management of the natural features in the study area, the Resource Data Division of Alberta Environmental Protection was requested to conduct a study, with the following objectives:

1. To provide an ecological land classification map of the study area, showing vegetation types matched to physical land classification units;

2. To prepare a description of the plant communities that occur in the study area, based on plant, soil and site data collection during the 1997 field season, with reference to previously defined Montane vegetation types;

3. To identify, describe and map significant natural features in the study area.

An ecological land classification integrates information about the biological and physical features of an area, recognizing a wide spectrum of environmental influences on ecosystems. According to Hills (1976), the objective of an ecological land classification is to subdivide a land area into discrete units which are located and identified based on ecologically significant similarities. Because this approach integrates many types of environmental information, it is particularly useful as a framework for environmental resource management and planning.

2.0 STUDY AREA DESCRIPTION

2.1 Location and History

The study area is located about 20 km southwest of Pincher Creek, Alberta (Fig. 1). All of Beauvais Lake Provincial Park (769.2 ha) is included in the study area, plus an adjacent quarter section (64 ha) which is under consideration for inclusion in the Park. The study area encompasses all or portions of the following lands:

Beauvais Lake Provincial Park:

-Twp 5 Rge 1 W5M: Sections 29 and 30, NW Sec. 21, and LSD 16 in Sec 20;

-Twp 5 Rge 2 W5M: SE Sec. 25, and LSD 3,5 and 6 in SW Sec. 25; NE Sec 25 east of Mill Creek, SE Sec. 36 east of Mill Creek,

Land proposed for acquisition (outside the current park boundaries):

-Twp 5 Rge 1 W5M: NW Sec. 19.

The boundaries of the study area generally follow legal grid lines, except in the northwest corner

Figure 1. Location of the Beauvais Lake Provincial Park Study Area

of the Park (NE Sec. 25 and SE Sec. 36), where the border is defined by Mill Creek.

Beauvais Lake has historically attracted many visitors from the region, for activities such as picnicking and fishing. Its value was first recognized in 1940, when about 62 ha (155 acres) near Beauvais Lake were reserved for protection. The lake was first stocked with trout in 1947 (Alberta Recreation and Parks 1980). Gradually over the years the Park was expanded in size. In 1959 the waters of Beauvais Lake were added, and in 1961 the land along the southwest shore was purchased. Lands west of the lake were added to the Park in several separate purchases. Section 30 was included by the end of 1969, and in 1972, land at the southeast end of the lake was added. In 1993, the Park was expanded to include the area between Section 30 and Mill Creek. Grazing was allowed in some parts of the Park until 1972, after which all grazing leases were cancelled.

2.2 Climate and Regional Classification

The study area lies within the Montane Natural Subregion of the Rocky Mountain Natural Region (Achuff 1994). The climate of the Montane is characterized by wide temperature fluctuations. This subregion has the warmest winter temperatures of any of the forested natural subregions in Alberta (Strong and Leggat 1992).

The closest climate stations to Beauvais Lake Provincial Park are at Pincher Creek and Beaver Mines, and temperature and precipitation data from these sites are summarized in Table 1. Beaver Mines weather station is situated at a lower elevation than most of the study area, but is likely representative of the climate. A more complete discussion of the climate in the study area can be found in Hydrogeological Consultants (1973).

The climate of the area is characterized by warm summers and relatively cold winters with periodic warming by chinook winds (warm winds of low humidity). The average annual precipitation at Beaver Mines is about 600 mm with almost 50% falling as rain (Environ. Canada, n.d.). There is an average frost-free period of 87 days (Alberta Parks 1990).

Climatic factors influencing the vegetation include strong prevailing southwesterly and westerly winds throughout the year and warm chinook winds in winter. Intermittent chinooks remove the protective snow cover, exposing the vegetation to high evapotranspiration rates and wide temperature fluctuations.

Table 1. Summary of temperature and precipitation data for two climate stations near the Beauvais Lake Provincial Park study area. (Environ. Canada, n.d.).

Station	Elevation	Mean annual temp. (° C)	May to Sept. mean temp.(°C)	Mean annual precip. (mm)	May to Sept. precip. (mm)
Pincher Creek	1155 m	4.4	13.6	543	304
Beaver Mines	1286 m	--*	--*	645	314

* - data not available

2.3 Hydrography

Beauvais Lake is approximately 3 km long and 0.5 km wide across at the widest point. It was originally a small lake of about 49 ha. A water control structure installed at the east end of the lake in 1952 raised the lake level by about 1.5 m, and increased the surface area to about 76 ha (Alberta Parks 1990). The installation of the water control structure resulted in flooding of a wooded area at the southeast end of the lake. Drowned trees and willows of the former shoreline are still visible around the lake as dead snags.

The lake is relatively shallow with a mean depth of 4.5 m and a maximum depth of 10.7 m (Woerns 1979). Surface drainage is via an intermittent creek (Chipman Creek), which flows from the long southeast arm of the lake into Pincher Creek. Full surface level of the lake (where water commences to enter the overflow channel of Chipman Creek) is 1368 m above sea level, a level which is rarely reached. The lake is subject to water level fluctuations due to variations in annual precipitation and to water management activity. In 1988, the water control structure was opened for 6 days to release water to downstream users (Alberta Parks 1990).

The relatively small watershed basin surrounding Beauvais Lake drains into the lake via a number of intermittent creeks and seepage from springs flowing off the surrounding hillsides. The largest of the in-flowing streams is Beaver Creek, which enters the southwest end of the lake.

Two beaver ponds are located near the north boundary of the Park, west of the campground. A series of old beaver dams supports an interesting mosaic of successional wetland and willow communities. Drainage of these ponds is into Mill Creek.

The largest creek in the study area is Mill Creek, at the west edge of the study area. A major flood in 1995 resulted in changes in the creek channel, as well as substantial deposition of flood

sediments. The hydrography shown on Maps 1 and 2 accompanying this report is based on 1982 aerial photography, and changes which have occurred since that time are not indicated.

2.4 Physiography and Bedrock Geology

Much of Beauvais Lake Provincial Park and surrounding area has a high local relief. About three-quarters of this area has moderate to steep slopes greater than 10° (18%) (Hydrogeological Consultants Ltd. 1973). Elevation in the study area ranges from approximately 1257 m (4125 ft) in Mill Creek Valley at the northwest corner of the Park, to about 1690 m (5545 ft) in the proposed new Park extension in the southwest part of the study area.

The study area is classed within the Southern Foothills District of the Rocky Mountain Foothills Region (Pettapiece 1986). Several northwest-southeast trending linear bedrock ridges are evident within the Park and in surrounding areas. These are caused by tectonic thrusting of older bedrock units over younger ones. Beauvais Lake itself is situated in the valley between two such linear ridges, and the southwestern shore parallels two adjacent thrust faults.

The oldest bedrock formation represented in the study area is the Kootenay Formation, of Lower Cretaceous to Upper Jurassic age (Hage 1940, Green 1972). The upper part of the Kootenay Formation contains a thin coal seam, which is exposed near Mill Creek in the northwest corner of the Park and within the area proposed for acquisition, south of the Park. One small abandoned coal mining operation is located in the Mill Creek Valley and another can be found south of the current park boundary.

Grey to greenish grey sandstones of the Blairmore Group underlie much of the area southwest of Beauvais Lake within the Park (Hage 1940). This formation is exposed on a ridge southwest of the campground. A volcanic sequence of bedrock, the Crowsnest Formation, overlies the Blairmore Formation. Weathered fragments of this unit are found on the top of a hill in the southwest corner of Section 30. A few small, fossil-bearing exposures of the soft shaly Blackstone Formation can be found along the lake's southwest shoreline (Alberta Parks 1990).

The next formation in the sequence underlying the study area, the Wapiabi Formation, underlies low marshy areas in the north part of the study area, but no exposures occur. The youngest rock formation in the study area, the Belly River Formation is of Upper Cretaceous age, and consists of coarse grey sandstone with interbedded shales. Sandstone outcrops of this formation can be found along the long ridge northeast of the lake.

2.5 Surficial Geology and Parent Materials

The study area has a complex glacial history, being affected by both Laurentide (continental) and Cordilleran (alpine) glaciation. Most of the study area is underlain by Cordilleran ground moraine. The northeast corner of the Park likely marks the southwesterly limit of continental glaciation in this area (Hydrogeological Consultants 1973; Walker et al 1991).

Minor amounts of glaciofluvial sediments occur in several parts of the study area. Post-glacial outwash deposits occur in the northwest corner of the Park, in the vicinity of the two large beaver ponds west of the campground. Ice-contact deposits may occur at the east end of the lake (Walker et al 1991). Early post-glacial alluvial deposits consisting mainly of coarse gravels occur along the Mill Creek Valley, which served at one time as a glacial outwash channel. The terraced edges of Mill Creek valley consist of coarse-textured glaciofluvial and fluvial gravels (there is a gravel mining operation just northwest of the Park on the east side of Mill Creek). The two ponds near the north boundary of the Park west of the campground are situated on a portion of a glacial outwash terrace.

Colluvial veneers over bedrock are the typical parent materials in upper elevation areas with steeper slopes. Recent fluvial deposits of sands and gravels occupy Mill Creek valley. An alluvial fan can be found at the mouth of a tributary stream entering the southwest corner of the lake. Lacustrine sediments are being deposited in Beauvais Lake and in the small ponds to the west of the lake.

2.6 Soils Overview

Information on principal soil units in the study area was obtained from the results of previous surveys (Greenlee 1974, Walker et al 1991). These data, plus detailed, site-specific soils data collected during field surveys in 1997 (this study), were used in the delineation of map units on the Ecological Land Classification map (Map 1). The soils information is summarized below.

Soil development is affected by factors such as microclimate, vegetation and parent materials. Five major soil orders are represented in the study area: Chernozems, Luvisols, Brunisols, Regosols and Gleysols. Moderately well to well-drained Orthic Black and, less commonly, Orthic Dark Gray Chernozems are found on the lower slopes. Dark Gray Luvisols have developed on mid to lower lushly forested slopes, reflecting the cool moist climatic conditions, and stable parent materials there (Walker et al 1991). The luvisolic soils have distinctly leached horizons at least 5 cm thick beneath the humus-rich topsoil.

Well to rapidly drained Orthic and Eluviated Dystric Brunisols predominate on the ridges and upper slopes, especially on the slopes southwest and northeast of the lake. Surface stoniness and shallow depth to bedrock (<5 m) or thin organic surface horizon are often observed on the ridges. Orthic Eutric Brunisols, of fairly high pH reflecting the calcareous parent materials, are associated with colluvial deposits on very steep rugged slopes. These soils commonly have very thin Ah horizons (topsoil) . Some rapidly drained Orthic Regosols (weakly developed soils which lack distinct horizons), also occur on the most exposed ridgetops. Orthic and Cumulic Regosols can also be found on recent fluvial deposits, especially along Mill Creek valley.

Orthic and Rego Humic Gleysols dominate on the poorly drained deposits adjacent to the lake, on associated wetlands and the ponds west of the campground. Small pockets of poorly drained

to very poorly drained Orthic Humic Gleysols are also found in seepage areas and along streams. They are usually characterized by hydrophytic vegetation.

2.7 Vegetation Overview

The Montane Natural Subregion in Alberta is characterized by a mosaic of forest and grassland vegetation, and is distinguished by the presence of Douglas-fir (*Pseudotsuga menziesii)* and limber pine (*Pinus flexilis)*(Achuff 1994). Complex topography creates variable ecological conditions, controlled by such factors as elevation, aspect, soils and parent materials. Therefore, many different plant community types can be found even across small areas. In the Beauvais Lake Provincial Park study area, an additional factor is human disturbance such as historic logging. All of these factors have created a patchwork of fescue grassland, deciduous woodland and mixed or coniferous forest in the study area.

Dominant tree species in the forests are douglas-fir, lodgepole pine (*Pinus contorta)*, white spruce (*Picea glauca),* aspen (*Populus tremuloides)* and balsam poplar (*Populus balsamifera)*. Several young successional stands of lodgepole pine occur in the west part of the study area.

In the deciduous forests, aspen is the dominant tree on the drier sites, with balsam poplar (*Populus balsamifera)* predominating on the sites with greater soil moisture. Throughout the study area, older aspen and balsam poplar stands are gradually succeeding to white spruce or douglas-fir. Succession at the drier sites is generally to douglas-fir or a mix of douglas-fir and white spruce, whereas where soil conditions are moister, the community is likely to succeed to white spruce. The mixed forest community types represent forests in an intermediate successional stage towards conifer-dominated types.

Small aspen copses dot the grassland areas, and aspen is gradually expanding into grasslands and forest openings. Scattered limber pine and douglas-fir grow on exposed grassy ridges. A single western white pine (*Pinus monticola)* occurs at the edge of a forest stand.

The grasslands are dominated by rough fescue (*Festuca campestris)*, Idaho fescue (*Festuca idahoensis)* and Parry oat grass (*Danthonia parryi)*, and a wide diversity of forbs. In some areas, shrubs are an important component of the grasslands. The fescue grasslands in southwest Alberta are more species-rich than central Alberta fescue grasslands (Moss and Campbell 1947)

Willow communities predominate at the edges of seepage areas and drainage depressions, and are most common along the perimeter of the ponds and at the shallow edges of wetlands at the east and west ends of the lake. Here, where water levels vary greatly both seasonally and from year-to-year, soil moisture conditions are constantly changing. Beaked willow (*Salix bebbiana),* a shrub species capable of withstanding the variable soil moisture conditions, dominates in these moist depressional areas.

Large expanses of emergent vegetation are found around the lake shoreline, especially in the

flooded areas at the east and west end of the lake, as well as in the ponds west of the campground. These wetland communities are dominated by water sedge (*Carex aquatilis)*, beaked sedge (*Carex utriculata)*, cattail (*Typha latifolia)*, swamp horsetail (*Equisetum fluviatile)* and common great bulrush (*Scirpus validus)*. The emergent vegetation supports many species of water birds, which depend on this habitat for nesting, feeding and hiding habitat.

A plant checklist based on records to the early 1990s for Beauvais Lake Provincial Park lists over 350 species, a very diverse assemblage (Alberta Parks 1994). The flora includes a relatively large number of rare or significant plant species, based on the 1996 Alberta Natural Heritage Information Centre list of species of concern (ANHIC 1996; see Section 4.3.1 below).

2.8 Fauna

Beauvais Lake Provincial Park and surrounding area support an abundant and diverse faunal assemblage. The diverse topography and vegetation provide feeding and breeding habitat and abundant escape terrain for many animal species.

Annotated lists of birds, mammals, reptiles, amphibians, fish and butterflies observed in the study area are included in other documents (Crack and Danielson 1974, Alberta Parks 1990, Alberta Parks 1996). A total of 140 bird species, 27 mammal species, 5 amphibians and 1 reptile have been listed. Because this (1997) study recorded only incidental observations of animals, the reader is referred to the other documents for complete animal species lists. However, a summary of the fauna in the study area is given below, and a discussion of the significant fauna is presented in Section 4.3.2.

The study area supports healthy populations of four ungulate species which can be found in the area year-round: elk or wapiti (*Cervus elaphus)*, moose (*Alces alces)*, white-tailed deer (*Odocoileus virginianus)* and mule deer (*Odocoileus hemionus)*. The upland meadows, often blown free of snow, provide important winter feeding habitat for large numbers of elk that overwinter in the study area. Moose frequent the less developed areas of lake shoreline, such as the sedge meadows at the west end of the lake, the island, and the extensive wetland areas at the east end. White-tailed deer are frequently observed at forest edges, while mule deer more commonly utilize open areas such as grassy ridges.

Black bear (*Ursus americanus)* and grizzly bear (*Ursus arctos)* occasionally wander through the study area. A young black bear was observed at the east end of the Park several times in June 1997. Two young cougars (*Felis concolor)* were recorded in the Park twice in June 1997. Active beaver (*Castor canadensis)* lodges can be found on the lake and on at least one of the ponds, and muskrats (*Ondatra zibethicus)* are also resident. Coyotes (*Canis latrans)* likely den in the area, as a family of four was recorded in the northwest corner in 1997. Columbian ground squirrels (*Spermophilus columbianus)*, northern pocket gophers (*Thomomys talpoides)*, and several other rodent species are abundant.

The bird population is very diverse. Berry-producing shrubs such as choke cherry (*Prunus virginiana)* and saskatoon (*Amelanchier alnifolia)* provide a good seasonal supply of food for birds such as cedar waxwings (*Bombycilla cedrorum)*. In coniferous areas, the gray jay (*Perisoreus canadensis)*, mountain chickadee (*Parus gambeli)*, dark-eyed junco (*Junco hyemalis)* and red-breasted nuthatch (*Sitta canadensis)* are common, while a different assemblage of birds utilize the deciduous woodlands. Typical birds of the grasslands include meadowlark (*Sturnella neglecta)*, vesper sparrow (*Pooecetes gramineus)* and chipping sparrow (*Spizella passerina)*. The abundant rodent population provides prey for several avian predators, including golden eagles (*Aquila chrysaetos)* and several species of hawks. Other interesting birds of prey observed in the area include osprey (*Pandion haliaetus)* and great grey owl (*Strix nebulosa)*. The varied wetland communities along the lake and pond shorelines support many water-loving birds, such as red-necked grebe (*Podiceps grisegena)* and common loon (*Gavia immer)*.

Tiger salamanders (*Ambystoma tigrinum)*, boreal toads (*Bufo boreas)*, northern leopard frogs (*Rana pipiens)*, western spotted frogs (*Rana pretiosa)* and red-sided garter snakes (*Thamniophis sirtalis)* have been recorded in the Park (Crack and Danielson 1974; this study). The northern leopard frog, observed in 1974 along the lakeshore (Crack and Danielson 1974), has experienced dramatic population declines in Alberta since the late 1970s (Wershler 1991, Alberta Environ. Prot. 1996), and its current status in the Park is unknown.

The fish population in the lake includes both native species and stocked trout populations. Several minnow species were caught during a 1978 survey (MacNeill 1979). Native white suckers (*Catastomus commersoni)* are common in the lake, and each year attempt to spawn near the mouth of Beaver Creek. Stocked trout species include brown trout (*Salmo trutto)* and rainbow trout (*Salmo gairdneri) (*Alberta Parks 1990).

Several fauna species recorded to date in the study area have been identified as requiring special management concern because populations are vulnerable or at risk, or because they are rare or sensitive. This includes species which have been recognized at the national level by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or at the provincial level by Alberta Environmental Protection (1996). A list and discussion of these significant fauna species is given in Section 4.3.2, below.

3.0 METHODS

3.1 Field Data Collection

An initial examination of terrain features was conducted using 1:10 000 scale black and white aerial photographs (flown June 3, 1997, Job 97-113, Roll No. AS 4772). This formed the basis of site selection. A brief literature review was also conducted to aid in planning the field work.

Field sampling took place June 21 to 29 and July 14 to 16, 1997. Forty-four sites were visited, at which a complete set of data was collected. In addition, abbreviated surveys were conducted at

10 'reconnaissance sites'. At each of the complete sites, a rélevé was established, consisting of a plot 10m X 10m for shrublands and grasslands, and 20m X 20m for forested areas. The physical environment (e.g. slope, aspect, landform) of each site was described according to the Ecological Land Survey Site Description Manual (Alberta Environmental Protection 1994), and one soil pit was dug and examined at each site. Names and foliar cover of all plant species present were recorded. At the reconnaissance sites, an abbreviated set of data was collected, including general observations on landform, soils, and vegetation. Photographs were taken at each site. An attempt was made to sample plots representative of the community or landscape unit, and to place at least one plot in each landscape unit type.

3.2 Vegetation Data Analysis (Plant Community Types)

Vegetation data were analyzed using the Braun-Blanquet tabular method described in Mueller-Dombois and Ellenberg (1974). This method involved a sorting or rearrangement of data to group sample sites according to similarities of species composition. The groups of sites are derived using a method of tabular sorting and rearrangement of both sites and plant species. Site groupings are then further refined into plant community types using site environmental characteristics such as landform and soil type.

Plant community types are named according to the dominant or representative plant species in one or more layers (for example, the aspen/snowberry community type has aspen predominating in the overstory tree layer, and snowberry in the shrub layer). Each community type is described in detail below, with species composition based on average species cover values at sites examined.

Many of the plant community types found in this study corresponded to other type descriptions for the Montane Natural Subregion. Willoughby et al (1996) describe range plant community types for the Montane Subregion. Archibald et al (1996) outline Montane plant community types within a hierarchical ecological framework. Wherever possible, plant community types identified in this study correspond to the types defined in these previous studies. Also, the forest community types described in Section 4.2.1 are sorted by moisture and nutrient regimes, according to the forest classification scheme of Archibald et al (1996).

Scientific and common names of plant species are based on the Alberta Plants and Fungi Master Species Group Checklists (Alberta Environmental Protection 1993). Plant taxonomy follows Moss (1983), Aiken and Darbyshire (1990) and Griffiths (1989).

3.3 Ecological Land Classification and Mapping

The hierarchical structure of an Ecological Land Classification (ELC) is based on decreasing size and increasing homogeneity of units which are lower in the hierarchy (Rowe 1979). The landscape is divided into ecological units based on parameters such as landform, surficial materials, slope, dominant soils and vegetation. Ecological units or map polygons are derived

from aerial photograph interpretation supported by site information collected during the field surveys. Each polygon is identified with a number, and coded descriptions of the ecological conditions in each are given in Appendix A. Physical land unit codes (for example L1= lacustrine deposits over undulating till, with gleyed black or dark grey chernozems) are defined in Appendix B.

The field data collected at specific sites in 1997 allowed detailed descriptions of the vegetation within many of the individual polygons. However, because of the variability in vegetation even across short distances, and the limitation of aerial photograph interpretation, it was often difficult to accurately predict a single plant community type in mapped polygons. For example, in forested vegetation, it was not possible to interpret understory forb species. Therefore, predicted vegetation type and the associated codes given for the forested polygons outlined on Map 1 correspond to the somewhat more general ecosite phase level of Archibald et al (1996), rather than plant community type. For shrubland, grassland and wetland vegetation, the vegetation is mapped based either on broad physiognomic category or, where possible, by specific plant community type. The vegetation mapping codes used in Map 1 are listed in Appendix C.

A tabular database was constructed to correspond to polygons outlined on the map, listing the dominant landscape descriptive variables and vegetation for each polygon. The database was prepared to allow future GIS analysis and presentation if required. Map 1 polygon numbers were related to the following list of parameters: Landform and surficial materials, Soils, Ecological moisture regime, Nutrient regime, and Vegetation.

Codes for soil classification are from the Canadian System of Soil Classification (Canada Soil Survey 1987).

3.4 Special Features Map

A second map was created which highlights parts of the study area identified as significant features. The evaluation of the significance of features or portions of the study area was based on a set of criteria outlined by Eagles (1984). Significant ecological features or areas were identified as those which satisfied any one or more of the following criteria:

1) performs a vital environmental, ecological or hydrological function
2) rare or unique geological or physiographic features or areas that contain them
3) significant rare or endangered plant or animal species or areas that support them
4) unique habitats that have limited representation in the region or are a small remnant of once large habitats which are now rare
5) contains an unusual diversity of plant and/or animal communities due to a variety of geomorphic features and microclimatic effects
6) contains large and relatively undisturbed habitats and provides sheltered habitat for species intolerant of human disturbance
7) provides an important linking function and permits the movement of animals over

considerable distances, including migration corridors and migratory stopover points
8) representative, or a good example of that feature or ecosystem within the biogeographic area
9) widespread community interest or the presence of highly valued features or wildlife species.

The status of significant plants or animals was based primarily on three sources: ANHIC (1996), COSEWIC (1996), and Alberta Environmental Protection (1996). Based on an evaluation of several factors, especially rarity and threats, these sources give animal or plant species a designated status to aid in setting management priorities. Summaries of the significant flora and fauna that occur in the study area are presented in Sections 4.3.1 and 4.3.2, below.

The specific locations and other details about significant rare plant populations are maintained in a provincial database (ANHIC - or Alberta Natural Heritage Information Centre), and data from this study were passed on to the relevant authorities for update of the database.

Information gathered during this study and from other research in the study area was used to define broad significant natural landscapes, shown on Map 2. Each significant landscape has unique ecological parameters, which in turn support or maintain significant natural features such as rare plants or fauna that occur there. A summary of Significant Landscapes, and the most important natural features within each landscape, is given in Section 4.3.3.

4.0 RESULTS

4.1 Ecological Land Classification

Map 1 shows the study area delineated into ecological units. The map legend includes physical land unit codes, defined in Appendix B, and vegetation type codes, defined in Appendix C.

4.2 Plant Community Types

Field data from the 45 detailed sites and 10 reconnaissance sites examined were classified into 21 plant community types, including forest communities, shrublands, grasslands, wetlands and disturbance communities. Plant communities develop in response to landform, surficial deposits, soils, and microsite characteristics such as aspect and slope position. Factors related to the past history of land use also influence species composition.

The vegetation mapping codes used on Map 1 are given in brackets after the name of each community type. Scientific and common names of plant species recorded during this study are given in Appendix D. A comparison of plant community types found in this study to Montane types identified in other studies is presented in Appendix E.

4.2.1 Forests

Management of the forests in the study area for at least the past 50 years has included protection from fire. This has allowed coniferous tree species to co-dominate with aspen or balsam poplar in much of the study area. However, selective logging of conifers has occurred historically over parts of the study area, such as west of the lake prior to the creation of the Park (Alberta Parks 1990). The logging has artificially created forest openings, and the most common pioneering tree species in these openings is aspen. As a result, where moisture and nutrients are not limiting, a wide variety of forest community types has developed, representing forests at different stages of succession.

Typical plant species and their average cover values, as well as environmental conditions found in each community type sampled during the 1997 field studies, are described below. The forest community types are sorted into ecosites or categories of ecological moisture and nutrient regimes (Archibald et al 1996). Thus, a forest community type on a site with a mesic ecological moisture regime and a rich nutrient regime is included within the mesic/rich ecosite category. All seven Montane ecosites identified by Archibald et al (1996) are represented in the study area.

SUBXERIC/POOR[1]

Douglas-fir - limber pine/ Rough fescue - Idaho fescue (a1)

Exposed rocky outcrops and steep south- or west-facing upper slopes are characterized by an open stand of douglas-fir and limber pine with an understory of grassland species. This community type is included in the driest and most nutrient-poor forested Montane ecosite (Archibald et al. 1996). The bedrock exposures investigated in the Beauvais Lake study area were generally rubbly sandstone or shale outcrops, often oriented in southeast-northwest-trending ridges. Soils in these relatively rugged areas were poorly developed, varying from Orthic Regosols on the bedrock ridgetops to Orthic Eutric Brunisols where colluvial or till veneer thinly covered the bedrock.

The ridgetops are very susceptible to wind erosion, and the drought conditions associated with exposure to drying winds limits the establishment of tree cover. Here, limber pine often grows in a shortened krummholz shape (Kuchar 1973), and the dwarf shrubs, common bearberry (*Arctostaphylos uva-ursi)* and juniper (*Juniperus* spp.), are often encountered. Where soils are more developed, cover of dwarf shrubs decreases and grass species predominate.

An impressive diversity of forb species was found in this community type. Many of these species are xerophytic, indicative of the dry, nutrient-poor soil conditions. Examples are leafy musineon (*Musineon divericatum)*, moss phlox (*Phlox hoodii)* and tufted fleabane (*Erigeron*

1 Refers to edatope grid (moisture/nutients) for the Montane Subregion (Archibald et al. 1996).

compositus). Several vegetation species included on the 1996 ANHIC Watch list (ANHIC 1996) were found only in this community type, including crested beardtongue (*Penstemon eriantherus)*, large-flowered beardtongue (*Penstemon lyallii)* and narrow-petalled stonecrop (*Sedum stenopetalum)*.

Community Type: Douglas-fir - limber pine/ Rough fescue - Idaho fescue	
Moisture regime: Subxeric	Nutrient regime: Submesotrophic
Soil type: Orthic Eutric Brunisol; Orthic Regosol	Soil drainage: well to rapid
Parent materials: till veneer over bedrock	Sites: 3, 25, 26a

Key and indicator species:

	Scientific name	Common name	Canopy cover (%)
Trees:	*Pseudotsuga menziesii*	Douglas-fir	10
	Pinus flexilis	Limber pine	4
Shrubs:	*Arctostaphylos uva-ursi*	Common bearberry	8
	Juniperus communis	Ground juniper	3
	Juniperus horizontalis	Creeping juniper	3
Forbs:	*Erigeron compositus*	Tufted fleabane	2
	Penstemon confertus	Yellow beardtongue	1
	Penstemon eriantherus	Crested beardtongue	1
	Penstemon lyallii	Large-flowered beardtongue	1
	Heuchera richardsonii	Richardson's alumroot	2
	Sedum stenopetalum	Narrow-petalled stonecrop	1
	Polemonium pulcherrimum	Showy Jacob's-ladder	1
	Anemone patens	Prairie crocus	3
	Anemone multifida	Cut-leaved anemone	1
	Erigeron caespitosus	Tufted fleabane	3
	Heterotheca villosa	Golden aster	2
	Balsamorhiza sagittata	Balsamroot	2
	Allium cernuum	Nodding onion	1
	Phlox hoodii	Moss phlox	1
	Musineon divericatum	Leafy musineon	1
	Selaginella densa	Prairie selaginella	5
	Antennaria parvifolia	Small-leaved everlasting	5
	Townsendia parryi	Parry's townsendia	1

Graminoids:	*Festuca campestris*	Rough fescue	15
	Festuca idahoensis	Idaho fescue	10
	Agropyron spicatum	Bluebunch wheat grass	10
	Koeleria macrantha	June grass	5
	Danthonia parryi	Parry oat grass	3
	Carex siccata	Hay sedge	2
	Carex stenophylla	Low sedge	2

SUBMESIC/POOR

Douglas-fir - lodgepole pine/ Bearberry - juniper (b1)

This community occurred on a gravelly level terrace adjacent to Mill Creek. An old creek channel bisected the terrace. Soils were weakly developed Eluviated Eutric Brunisols on fluvial gravels. The presence of bearberry and juniper are again indicative of the dry site conditions; however, the ecological moisture regime was slightly more favourable in this valley site than in the douglas-fir - limber pine -dominated sites. The graminoid layer in this community type was poorly developed. The forest canopy coverage varied but was generally quite open, and several dead conifers were noted on the site examined. About 10% of the ground surface was unvegetated. The site supported one plant species on the 1996 ANHIC Watch List (ANHIC 1996), the mariposa lily or *Calochortus apiculatus*.

Community Type: Douglas-fir – lodgepole pine/ Bearberry - juniper	
Moisture regime: submesic	Nutrient regime: submesotrophic
Soil type: Eluviated Eutric Brunisol	Soil drainage: well to rapid
Parent materials: fluvial (gravelly floodplain)	Sites: #36

Key and indicator species:			
Scientific name		**Common name**	**Canopy cover (%)**
Trees:	*Pseudotsuga menziesii*	Douglas-fir	12
	Pinus contorta	Lodgepole pine	4
	Picea glauca	White spruce	5
	Populus balsamifera	Balsam poplar	2

Shrubs:	*Arctostaphylos uva-ursi*	Bearberry	15
	Juniperus communis	Ground juniper	20
	Shepherdia canadensis	Canada buffaloberry	5
	Elaeagnus commutata	Silverberry	3
	Symphoricarpos occidentalis	Buckbrush	3
	Linnaea borealis	Twinflower	2
Forbs:	*Antennaria parvifolia*	Small-leaved everlasting	5
	Aster ciliolatus	Lindley's aster	3
	Lupinus sericeus	Perennial lupine	2
	Erigeron glabellus	Smooth fleabane	2
	Fragaria virginiana	Wild strawberry	2
	Anemone multifida	Cut-leaved anemone	1
	Allium cernuum	Nodding onion	1
	Calochortus apiculatus	Mariposa lily	1
	Aquilegia flavescens	Yellow columbine	1
Graminoids:	*Elymus innovatus*	Hairy wild rye	6
	Agropyron trachycaulum	Slender wheat grass	5
	Calamagrostis purpurascens	Purple reed grass	4
	Poa pratensis	Kentucky bluegrass	3

SUBMESIC/MEDIUM

Douglas-fir - white spruce / needle litter (c1)

This community is typified by closed forest canopies and sparse understory vegetation. Steep slopes and usually coarse-textured, rapidly-drained soils, result in moisture levels that are relatively dry for the subregion, although not as dry as in the communities described above. The closed forest canopies result in a shaded forest floor and relatively low species richness. In fact, much of the forest floor at some of the sites is unvegetated and covered with needle litter. At other sites, heart-leaved arnica (*Arnica cordifolia)* mats the forest floor. Willoughby et al (1996) describe a similar white spruce- douglas-fir/ white meadowsweet community.

The composition of the overstory is dependent on the successional stage of the site. Sites which have escaped recent fire or logging, such as parts of the steep east slopes of Mill Creek valley and the steep north-facing slope of the ridge north of Beauvais Lake, are more advanced successionally and support mature douglas-fir. Succession on these submesic/submesotrophic, steep south or west-facing sites with shallow soils is towards douglas-fir, or a mix of douglas-fir and white spruce (Strong 1992, Archibald et al 1996). However, succession from lodgepole pine may be slow due to the dry conditions.

Some of the douglas-firs at these sites are very large trees. Since old-growth forests are becoming increasingly rare in the Montane, these mature coniferous forests should be considered

a significant natural feature (see Section 4.3.3).

Community Type: Douglas-fir - white spruce / needle litter	
Moisture regime: submesic	Nutrient regime: submesotrophic
Soil type: Orthic Dystric Brunisols	Soil drainage:well to rapid
Parent materials: colluvial and till veneers over bedrock	Sites: 9, 14, 16, 23, 24, 26

Key and indicator species:			
Scientific name		**Common name**	**Canopy cover (%)**
Trees:	*Pseudotsuga menziesii*	Douglas-fir	30
	Picea glauca	White spruce	15
	Pinus contorta	Lodgepole pine	5
Shrubs:	*Spiraea betulifolia*	White meadowsweet	10
	Linnaea borealis	Twinflower	5
	Shepherdia canadensis	Canada buffaloberry	3
	Vaccinium caespitosum	Dwarf bilberry	2
	Clematis occidentalis	Blue clematis	1
Forbs:	*Arnica cordifolia*	Heart-leaved arnica	12
	Fragaria virginiana	Wild strawberry	2
	Aster conspicuus	Showy aster	1
	Pyrola chlorantha	Greenish-flowered wintergreen	1
	Goodyera oblongifolia	Rattlesnake plantain	1
	Woodsia scopulina	Mountain woodsia	1
	Aquilegia flavescens	Yellow columbine	1
Graminoids:	*Elymus innovatus*	Hairy wild rye	3
	Calamagrostis rubescens	Pine grass	2
	Poa sandbergii	Sandberg bluegrass	1
	Carex filifolia	Thread-leaved sedge	1

Lodgepole pine/ needle litter (c2)

This community type, and the environmental conditions in which it grows, are artifacts of recent fire. Two stands of pioneering young lodgepole pine were sampled in the study area, on xeric, south-facing, recently burned slopes. Soils were very poorly developed Orthic Regosols and Orthic Eutric Brunisols in a thin veneer of till over bedrock. Other than lodgepole pine, there was very little growing at these sites, and needle litter covered the thin layer of soil on the bedrock. The large-flowered beardtongue (*Penstemon lyallii)*, included on the Alberta Watch List (ANHIC 1996), was recorded as a single individual at one of the sites.

Community Type: Lodgepole pine/ needle litter	
Moisture regime: xeric	Nutrient regime: submesotrophic
Soil type: Orthic Regosol (dominant); Orthic Eutric Brunisol	Soil drainage: rapid
Parent materials: till veneer over bedrock	Sites: 27, T27

Key and indicator species:			
Scientific name		**Common name**	**Canopy cover (%)**
Trees:	*Pinus contorta*	Lodgepole pine	50
Shrubs:	*Juniperus communis*	Ground juniper	2
Forbs:	*Penstemon lyallii* *Heuchera richardsonii*	Large-flowered beardtongue Richardson's alumroot	1 1

MESIC/MEDIUM

Douglas-fir - white spruce - lodgepole pine / White meadowsweet (d1, d2)

The dominant overstory species and the cover of white meadowsweet (*Spiraea betulifolia)* in this community type also vary with the successional status of the site. These stands were found on moderate slopes with northwest aspects, and soils were Orthic Dark Gray Luvisols developed on colluvial or fluvial veneers over till. Compared to the submesic / medium sites described above, the mesic/medium mixed coniferous forests occurred at slightly lower slope sites, where soils were better developed. The presence of snowberry (*Symphoricarpos albus)*, and the relatively high cover of pine grass (*Calamagrostis rubescens)* indicate more favourable soil moisture and nutrient conditions.

At site #28, there was some evidence that a cool ground fire had occurred in the past, which had scorched but not killed the trees, and left a thin layer of charcoal at a shallow depth (<10 cm below the surface).

Community Type: Douglas-fir - white spruce - lodgepole pine / White meadowsweet	
Moisture regime: mesic	Nutrient regime: mesotrophic
Soil type: Orthic Dark Grey Luvisol	Soil drainage: well
Parent materials: colluvial and fluvial veneers over till	Sites: 18, 28

Key and indicator species:			
	Scientific name	**Common name**	**Canopy cover (%)**
Trees:	*Pseudotsuga menziesii*	Douglas-fir	20
	Picea glauca	White spruce	15
	Pinus contorta	Lodgepole pine	15
	Populus tremuloides	Aspen	5
Shrubs:	*Spiraea betulifolia*	White meadowsweet	20
	Symphoricarpos albus	Snowberry	10
	Rosa acicularis	Prickly rose	2
	Shepherdia canadensis	Canada buffaloberry	2
	Linnaea borealis	Twinflower	5
Forbs:	*Arnica cordifolia*	Heart-leaved arnica	10
	Erythronium grandiflorum	Glacier lily	7
	Lathyrus ochroleucus	Yellow peavine	5
	Orthilia secunda	One-sided wintergreen	1
	Taraxacum officinale	Common dandelion	1
	Viola adunca	Early blue violet	1
	Fragaria virginiana	Wild strawberry	3
Graminoids:	*Calamagrostis rubescens*	Pine grass	25
	Agropyron trachycaulum	Slender wheat grass	5
	Elymus innovatus	Hairy wild rye	5
	Poa pratensis	Kentucky bluegrass	5

Aspen - white spruce / White meadowsweet - snowberry (d3)

This community was found on a fluvial terrace adjacent to a floodplain. The environmental characteristics of the site had been altered by heavy sediment deposition during the recent major flood. Fine loamy sand had buried the Orthic Eutric Brunisols, and recent sediment deposits were up to 30 cm thick. Although forb and graminoid cover was insignificant, shrub cover was extensive, perhaps benefitting from nutrient enrichment associated with the recent flooding. Some colonization of recent flood deposits by such species as horsetails (*Equisetum spp)* and strawberry (*Fragaria virginiana)* had occurred. About 5% of the ground was still non-vegetated bare ground, however.

Community Type: Aspen - white spruce / White meadowsweet - snowberry	
Moisture regime: mesic	Nutrient regime: mesotrophic
Soil type: Orthic Eutric Brunisol (buried)	Soil drainage: rapid

Community Type: Aspen - white spruce / White meadowsweet - snowberry	
Parent materials: fluvial	Sites: #38

Key and indicator species:			
	Scientific name	**Common name**	**Canopy cover (%)**
Trees:	*Populus tremuloides*	Aspen	15
	Picea glauca	White spruce	10
	Populus balsamifera	Balsam poplar	5
Shrubs:	*Spiraea betulifolia*	White meadowsweet	40
	Symphoricarpos albus	Snowberry	30
	Amelanchier alnifolia	Saskatoon	7
	Rosa acicularis	Prickly rose	10
	Rubus idaeus	Wild red raspberry	5
Forbs:	*Aster conspicuus*	Showy aster	3
	Equisetum hyemale	Common scouring-rush	1
	Equisetum laevigatum	Smooth scouring-rush	1
	Equisetum scirpoides	Dwarf scouring-rush	1
	Equisetum arvense	Common horsetail	1
	Fragaria virginiana	Wild strawberry	2
	Osmorhiza depauperata	Spreading sweet cicely	1
Graminoids:	*Calamagrostis canadensis*	Bluejoint	5
	Elymus innovatus	Hairy wild rye	4
	Elymus canadensis	Canada wild rye	1
	Poa pratensis	Kentucky bluegrass	5

White spruce/ moss (d3)

The white spruce/moss community type is the predicted climax on sites occupied by the douglas-fir - white spruce - lodgepole pine / white meadowsweet and the aspen - white spruce/ white meadowsweet community types. In the study area, the white spruce / moss type was found on north or northeast-facing slopes near the bottoms of drainage channels, most frequently on lower slopes. It occurred on a variety of soils, including Orthic Dark Gray Luvisols, Orthic Dystric Brunisols and Gleyed Dark Gray Chernozems. Favourable moisture regimes help to protect these areas from fire, allowing succession to white spruce. As a result of the dense spruce overstory, little light hits the forest floor, and cover of shrubs, forbs and graminoids is low.

Community Type: White spruce / moss	
Moisture regime: mesic	Nutrient regime: mesotrophic

Community Type: White spruce / moss	
Soil type: Dark Grey Luvisol, Orthic Dystric Brunisol	Soil drainage: moderately well
Parent materials: fluvial and colluvial	Sites: 10, 33, 41

Key and indicator species:			
Scientific name		**Common name**	**Canopy cover(%)**
Trees:	*Picea glauca*	White spruce	65
	Populus balsamifera	Balsam poplar	5
	Populus tremuloides	Aspen	1
Shrubs:	*Symphoricarpos albus*	Snowberry	5
	Spiraea betulifolia	White meadowsweet	3
Forbs:	*Arnica cordifolia*	Heart-leaved arnica	3
	Moneses uniflora	One-flowered wintergreen	1
	Orthilia secunda	One-sided wintergreen	1
	Viola canadensis	Canada violet	2
	Goodyera oblongifolia	Rattlesnake plantain	1
Graminoids:	*Calamagrostis rubescens*	Pine grass	4
Mosses:	*Pleurozium schreberi*	Schreber's moss	25
	Hylocomium splendens	Stairstep moss	10
	Ptilium crista-castrensis	Knight's plume moss	5

MESIC/RICH

Aspen/Snowberry (e2)

Aspen/snowberry is the modal deciduous forest type growing where moisture conditions are mesic and nutrient conditions are permesotrophic (rich). This community type was one of the most frequently sampled in the study area. Dark Gray Luvisols were the most common soils, and slopes were gentle to moderate. Sites on gentler slopes were moister, and more likely to support successional young spruce. Four plant species on the ANHIC Tracking or Watch lists (ANHIC 1996), Raynold's sedge (*Carex raynoldsii)*, yellow angelica (*Angelica dawsonii)*, Alaska onion grass (*Melica subulata)* and woodland brome (*Bromus vulgaris)*, were identified within this community type. Succession at these sites is to white spruce or douglas-fir or a combination of both.

Community Type: Aspen/Snowberry	
Moisture regime: mesic	Nutrient regime: permesotrophic

Community Type: Aspen/Snowberry	
Soil type: Dark Grey Luvisol, Gleyed Dark Grey Chernozem	Soil drainage: moderately well to well
Parent materials: Till (dominant); Lacustrine	Sites: 7, 8, 15a, 17, 19, 19b, 29, 31, 39

Key and indicator species:			
Scientific name		**Common name**	**Canopy cover (%)**
Trees:	*Populus tremuloides*	Aspen	25
	Populus balsamifera	Balsam poplar	3
	Picea glauca	White spruce	5
	Pseudotsuga menziesii	Douglas-fir	2
Shrubs:	*Symphoricarpos albus*	Snowberry	30
	Amelanchier alnifolia	Saskatoon	8
	Rosa woodsii	Common wild rose	3
	Ribes inerme	Mountain gooseberry	1
	Spiraea betulifolia	White meadowsweet	8
	Rubus idaeus	Wild red raspberry	2
	Rubus parviflorus	Thimbleberry	2
Forbs:	*Angelica dawsonii*	Yellow angelica	20
	Senecio foetidus	Marsh butterweed	5
	Heracleum lanatum	Cow parsnip	10
	Viola canadense	Western Canada violet	4
	Osmorhiza chilensis	Blunt-fruited sweet cicely	1
	Smilacina racemosa	False Solomon's-seal	1
	Disporum trachycarpum	Fairybells	2
	Actaea rubra	Baneberry	2
	Valeriana dioica	Northern valerian	2
	Streptopus amplexifolius	Clasping-leaved twisted-stalk	2
Graminoids:	*Calamagrostis rubescens*	Pine grass	30
	Melica subulata	Alaska onion grass	8
	Bromus vulgaris	Woodland brome	5
	Poa pratensis	Kentucky bluegrass	3
	Phleum pratense	Timothy	1
	Carex raynoldsii	Raynold's sedge	1

Aspen - Douglas-fir / Snowberry / Pine grass (e2)

This community type represents a mixed forest succeeding to douglas-fir. Successional young douglas-fir, as well as white spruce, occurs sporadically. Historical selective logging is evident in the vicinity of many of the sites where this community was found, especially west of the lake. The openings created by the logging are being filled in by aspen. Also, scattered among the younger aspen were individual douglas-firs that were very large. Again, these individual trees have survived both the logging and likely a cool ground fire in the past, and because of their impressive size, should be considered significant features (refer to Section 4.3.3).

Community Type: Aspen - douglas-fir / Snowberry / Pine grass	
Moisture regime: mesic	Nutrient regime: permesotrophic
Soil type: Orthic Grey Luvisol	Soil drainage: well to moderately well
Parent materials: colluvial slopewash over till	Sites: #15b, 21

Key and indicator species:

	Scientific name	Common name	Canopy cover (%)
Trees:	*Populus tremuloides*	Aspen	15
	Pseudotsuga menziesii	Douglas-fir	10
	Picea glauca	White spruce	5
Shrubs:	*Symphoricarpos albus*	Snowberry	30
	Spiraea betulifolia	White meadowsweet	3
	Rosa woodsii	Common wild rose	15
Forbs:	*Angelica dawsonii*	Yellow angelica	20
	Geranium richardsonii	Wild white geranium	4
	Actaea rubra	Baneberry	3
	Vicia americana	Wild vetch	1
	Erythonium grandiflorum	Glacier lily	3
Graminoids:	*Calamagrostis rubescens*	Pine grass	15
	Elymus innovatus	Hairy wild rye	10
	Poa pratensis	Kentucky bluegrass	8

Douglas-fir - white spruce / Snowberry / Baneberry (e3)

A successionally mature or old-growth forest community was found on Orthic Eutric Brunisols developed on a moderate north-facing slope of a tall ridge northeast of the lake. This slope represented the lee side of the ridge, and prevailing southwest winds had deposited a blanket of eolian deposits eroded from the subxeric south-facing slope on the windward side.

This north-facing slope has escaped fire for hundreds of years (P. Murphy, Renewable

Resources, Univ. of Alberta, pers.comm.), and, for some reason, also apparently escaped extensive logging. Old growth coniferous forests are rare in the study area and should be considered a significant feature.

Woodland brome (*Bromus vulgaris)*, a significant plant species in Alberta (AHNIC 1996), was identified in this community.

Community Type: Douglas-fir - white spruce/ Snowberry / Baneberry	
Moisture regime: mesic	Nutrient regime: permesotrophic
Soil type: Orthic Eutric Brunisol	Soil drainage: well
Parent materials: Eolian blanket over till	Sites: #40

Key and indicator species:			
Scientific name		**Common name**	**Canopy cover (%)**
Trees:	*Pseudotsuga menziesii*	Douglas-fir	35
	Picea glauca	White spruce	25
Shrubs:	*Symphoricarpos albus*	Snowberry	10
	Spiraea betulifolia	White meadowsweet	3
Forbs:	*Actaea rubra*	Baneberry	30
	Disporum trachycarpum	Fairybells	15
	Veratrum eschscholtzii	Green false hellebore	2
	Viola canadense	Canada violet	10
	Smilacina racemosa	False Solomon's-seal	2
	Thalictrum venulosum	Veiny meadow rue	2
	Sanicula marilandica	Snakeroot	1
	Osmorhiza depauperata	Spreading sweet cicely	2
Graminoids:	*Bromus vulgaris*	Woodland brome	15

SUBHYGRIC/RICH

Balsam poplar - white spruce / Snowberry (f1)

This community type was found on rich Orthic Dark Gray or Orthic Black Chernozemic soils, developed on fluvial or colluvial veneers over till, on gentle lower slopes near drainage channels. It represents a successionally more advanced stage of the balsam poplar / snowberry community discussed in Archibald et al (1996). The subhygric moisture regimes have allowed these sites to escape fire long enough that white spruce are common in the understory. Four rare plant species, woodland brome, Alaska onion grass, yellow angelica and western sweet cicely (*Osmorhiza*

occidentalis) were recorded in this community type.

Community Type: Balsam poplar - white spruce / Snowberry	
Moisture regime: subhygric	Nutrient regime: permesotrophic
Soil type: Orthic Dark Gray Chernozem; Orthic Black Chernozem	Soil drainage: moderately well
Parent materials: fluvial and colluvial veneers over till	Sites: 13, 43a

Key and indicator species:

	Scientific name	Common name	Canopy cover (%)
Trees:	*Populus balsamifera*	Balsam poplar	20
	Picea glauca	White spruce	10
	Populus tremuloides	Aspen	5
Shrubs:	*Symphoricarpos albus*	Snowberry	35
Forbs:	*Heracleum lanatum*	Cow parsnip	15
	Angelica dawsonii	Yellow angelica	10
	Geum rivale	Purple avens	4
	Thalictrum occidentale	Western meadow rue	5
	Osmorhiza occidentalis	Western sweet cicely	4
	Geum aleppicum	Yellow avens	1
	Lathyrus ochroleucus	Yellow peavine	2
	Erythronium grandiflorum	Glacier lily	1
	Viola canadense	Western Canada violet	4
	Senecio foetidus	Marsh butterweed	3
Graminoids:	*Elymus canadensis*	Canada wild rye	5
	Melica subulata	Alaska onion grass	6
	Calamagrostis rubescens	Pine grass	10
	Bromus vulgaris	Woodland brome	5
	Phleum pratense	Timothy	5
	Poa palustris	Fowl bluegrass	5

HYGRIC/RICH

White spruce - balsam poplar/ River alder (g1)

This community has an overstory similar to the balsam poplar - white spruce / snowberry type

described above. However, the moisture conditions are hygric, and soils are imperfectly to poorly drained and damp for most of the growing season. Nutrient-rich seepage occurs at sites occupied by this community. Soils were Rego-Humic Gleysols developed on a thin colluvial veneer over till. The moisture and nutrient conditions have promoted growth of river alder (*Alnus tenuifolia)*, which favours seepage areas with high water tables. Forb species such as bishop's cap (*Mitella nuda)*, sweet-scented bedstraw (*Galium triflorum),* pale coralroot (*Corallorhiza trifida)* and clasping-leaved twisted stalk (*Streptopus amplexifolius*) are typical of these moist shady woods. Two rare or significant plant species were recorded in this community, Alaska onion grass and yellow angelica.

Community Type: White spruce - balsam poplar / River alder	
Moisture regime: hygric	Nutrient regime: permesotrophic
Soil type: Rego-Humic Gleysol	Soil drainage: imperfect
Parent materials: colluvial veneer over till	Sites: #20, 43b

Key and indicator species:			
Scientific name		**Common name**	**Canopy cover (%)**
Trees:	*Picea glauca*	White spruce	20
	Populus balsamifera	Balsam poplar	10
	Pseudotsuga menziesii	Douglas-fir	5
Shrubs:	*Alnus tenuifolia*	River alder	25
	Cornus stolonifera	Red-osier dogwood	10
	Symphoricarpos albus	Snowberry	10
	Rubus parviflorus	Thimbleberry	6
	Lonicera dioica	Twining honeysuckle	4
	Linnaea borealis	Twinflower	10
Forbs:	*Arnica cordifolia*	Heart-leaved arnica	15
	Thalictrum occidentale	Western meadow rue	8
	Viola canadense	Western Canada violet	5
	Streptopus amplexifolius	Clasping-leaved twisted stalk	2
	Disporum trachycarpum	Fairybells	2
	Mitella nuda	Bishop's-cap	1
	Heracleum lanatum	Cow parsnip	5
	Angelica dawsonii	Yellow angelica	3
	Erythronium grandiflorum	Glacier lily	1
	Corallorhiza trifida	Pale coralroot	1

Graminoids:	*Melica subulata* *Calamagrostis rubescens* *Bromus inermis*	Alaska onion grass Pine grass Smooth brome	15 10 4

Balsam poplar - white spruce / Horsetail (g1)

The two sites supporting this community were both on gentle north-facing slopes within shallow drainage channels adjacent to small water courses. The water table at both sites was relatively close to the surface (e.g. less than 0.5 m at site 22). Soils were Gleyed Humic Regosols or Orthic Humic Gleysols, developed on a blanket of fluvial deposits over till. Balsam poplar is likely the pioneering species on these riparian sites, with succession to white spruce. The dominance of horsetails in the forb layer indicates a damp site.

Community Type: Balsam poplar - white spruce/ horsetail	
Moisture regime: hygric	Nutrient regime: permesotrophic
Soil type: Gleyed Humic regosol, Orthic Humic Gleysol	Soil drainage: imperfectly to poorly
Parent materials: fluvial	Sites: 22, 42

Key and indicator species:			
Scientific name		**Common name**	**Canopy cover (%)**
Trees:	*Populus balsamifera* *Picea glauca* *Populus tremuloides*	Balsam poplar White spruce Aspen	17 15 5
Shrubs:	*Alnus tenuifolia* *Symphoricarpos albus* *Rubus parviflorus*	River alder Snowberry Thimbleberry	5 3 1
Forbs:	*Equisetum arvense* *Angelica dawsonii* *Ranunculus acris* *Geranium richardsonii* *Actaea rubra* *Epilobium glaberrimum* *Senecio foetidus* *Luzula parviflora* *Mentha arvensis* *Geum aleppicum*	Common horsetail Yellow angelica Tall buttercup Wild white geranium Baneberry Willowherb Marsh butterweed Small-flowered wood-rush Wild mint Yellow avens	55 5 8 5 5 2 2 1 1 1

Graminoids:	*Carex raynoldsii*	Raynold's sedge	3
	Calamagrostis canadensis	Bluejoint	4
	Phleum pratense	Timothy	3
	Poa palustris	Fowl bluegrass	2

White spruce / Thimbleberry / Horsetail (g2)

The water table was high at this site, located adjacent to a creek. This site is successionally further advanced than the balsam poplar - white spruce/ horsetail community described above. Again, the presence of river alder, water hemlock (*Cicuta maculata),* meadow horsetail (*Equisetum pratense*), and fowl bluegrass (*Poa palustris)* are all indicative of the rich, damp conditions. There was substantial cover of thimbleberry (*Rubus parviflorus)* at this site, as a result of the high nutrient levels.

Community Type: White spruce / Thimbleberry / Horsetail	
Moisture regime: Hygric	Nutrient regime: permesotrophic
Soil type: Humic Regosol	Soil drainage: moderately well
Parent materials: fluvial	Sites: #11

Key and indicator species:			
	Scientific name	**Common name**	**Canopy cover (%)**
Trees:	*Picea glauca*	White spruce	20
	Pseudotsuga menziesii	Douglas-fir	5
	Populus balsamifera	Balsam poplar	5
Shrubs:	*Rubus parviflorus*	Thimbleberry	30
	Alnus tenuifolia	River alder	2
	Symphoricarpos albus	Snowberry	3
Forbs:	*Heracleum lanatum*	Cow parsnip	15
	Cicuta maculata	Water hemlock	15
	Equisetum pratense	Meadow horsetail	10
	Thalictrum venulosum	Veiny meadow rue	5
	Actaea rubra	Baneberry	2
	Smilacina racemosa	False Solomon's-seal	3
	Angelica dawsonii	Yellow angelica	1
Graminoids:	*Poa palustris*	Fowl bluegrass	5

4.2.2 Shrublands

Shrubby forb meadow (Snowberry– rose / fireweed/Kentucky bluegrass) **(sh1)**

Shrubby forb meadow communities grow in moister swales and nivation hollows or snow-lie areas within grasslands, and on slopes in transition from grassland to forest. These sites can be dominated by forbs or by shrubs, depending on site conditions. Typically, rich and deep black chernozemic soils support a lush forb meadow community with shrubs occurring in thickets. As cover of shrub species increases, the percent cover of grass species such as rough fescue decreases. Common forb species are fireweed (*Epilobium angustifolium)*, showy aster (*Aster conspicuus)* and wild bergamot (*Monarda fistulosa)*, characteristic of nutrient-rich regimes, and the dominant shrub species are snowberry (*Symphoricarpos occidentalis)*, common wild rose (*Rosa woodsii)*, choke cherry (*Prunus virginiana)* and saskatoon (*Amelanchier alnifolia)*. A similar low shrub community was described by Bradshaw et al (1997) in the Whaleback area.

Shrublands provide excellent browse for wildlife (Jaques and Corbin 1981). Two rare plant species were found in this community type, mariposa lily (*Calochortus apiculatus)* and California oat grass (*Danthonia californica)*.

Community Type: Shrubby forb meadow (Snowberry– rose / fireweed/Kentucky bluegrass)	
Moisture regime: mesic to subhygric	Nutrient regime: mesotrophic to permesotrophic
Soil type: Orthic Black Chernozem	Soil drainage: moderately well to well
Parent materials: fluvial; colluvial slopewash over till	Sites: 5, 6, 12, 37

Key and indicator species:			
	Scientific name	**Common name**	**Canopy cover (%)**
Shrubs:	*Symphoricarpos occidentalis*	Snowberry	5-20
	Rosa woodsii	Common wild rose	5
	Amelanchier alnifolia	Saskatoon	5
	Prunus virginiana	Chokecherry	5
	Populus tremuloides (low)	Aspen – saplings	5
Forbs:	*Epilobium angustifolium*	Fireweed	10-25
	Monarda fistulosa	Wild bergamot	8
	Aster conspicuus	Showy aster	8
	Geranium viscosissimum	Sticky purple geranium	4
	Smilacina stellata	Star-flowered Solomon's seal	4
	Calochortus apicularis	Mariposa lily	1
	Asclepias speciosa	Showy milkweed	2
	Erigeron glabellus	Smooth fleabane	2

Graminoids:	*Poa pratensis*	Kentucky bluegrass	20
	Festuca campestris	Rough fescue	15
	Danthonia californica	California oat grass	3
	Stipa richardsonis	Richardson needle grass	2
	Bromus carinatus	Keeled brome	1

4.2.3 Grasslands

Rough fescue - Kentucky bluegrass (gr1)

The modal grassland community type on Orthic Black Chernozemic soils in the Montane subregion in southern Alberta, including the study area, is likely rough fescue - Parry oatgrass - Idaho fescue (Willoughby et al 1996, Moss and Campbell 1947). However, during the 1997 field work in the Beauvais Lake study area, no rough fescue - Parry oatgrass - Idaho fescue sites were found. Although the modal grassland community likely exists in some grassland areas of the park, this study found only a modified phase of this community, namely a rough fescue - Kentucky bluegrass type.

The predominance of Kentucky bluegrass (*Poa pratensis)* in the study area is likely due to the impacts of historic grazing. The non-native Kentucky bluegrass invades grazed lands where moisture conditions are favourable (Moss and Campbell 1947). The lands in and around Beauvais Lake Provincial Park were homesteaded as early as 1898 and used for grazing cattle and horses. Grazing permits were held on many of the lands within the park (including the north half of sections 29 and 30 and the southeast quarter of section 29) up to 1972, after which all grazing leases were cancelled. The area to the west of the lake had been grazed to the extent that native vegetation was altered and hiking trails damaged (Alberta Recreation and Parks nd; McLintock 1983; Mountain 1980).

The effects of Kentucky bluegrass establishment in fescue grasslands are discussed by Willoughby et al (1996) and Looman (1969). Once Kentucky bluegrass becomes established in an area, it competes with the native grasses, including rough fescue, for dominance. Therefore, an area invaded by Kentucky bluegrass may not revert back to the original vegetation even when rested from grazing (Willoughby et al 1996).

Community Type: Rough fescue - Kentucky bluegrass	
Moisture regime: Mesic	Nutrient regime: Permesotrophic
Soil type: Orthic Black Chernozem	Soil drainage: well
Parent materials: till	Sites: #02, 34, 44

Key and indicator species:	

Scientific name		Common name	Canopy cover (%)
Shrubs:	*Potentilla fruticosa*	Shrubby cinquefoil	1
	Rosa woodsii	Common wild rose	1
Forbs:	*Aster ciliolatus*	Lindley's aster	2
	Erigeron glabellus	Smooth fleabane	5
	Arnica fulgens	Shining arnica	3
	Gaillardia aristata	Gaillardia	3
	Lupinus sericeus	Perennial lupine	1
	Geum triflorum	Three-flowered avens	2
	Ranunculus cardiophyllus	Heart-leaved buttercup	1
	Delphinium bicolor	Low larkspur	1
	Geranium viscosissimum	Sticky purple geranium	2
Graminoids:	*Festuca campestris*	Rough fescue	35
	Poa pratensis	Kentucky bluegrass	30
	Phleum pratense	Timothy	5

Parry oatgrass - Rough fescue - Idaho fescue (gr2)

This community type was found in somewhat drier soil conditions than the rough fescue - Kentucky bluegrass -dominated sites. Parry oatgrass (*Danthonia parryi)* and Idaho fescue (*Festuca idahoensis)* tend to increase and rough fescue declines as soils become drier, coarser - textured or rapidly drained. Thus the parry oatgrass - Idaho fescue - rough fescue community tends to occur on upper slopes. Forb species indicative of the drier soil conditions include prairie crocus (*Anemone patens)*, death camas (*Zigadenus venenosus)*, and three-flowered avens (*Geum triflorum)*. Balsamroot (*Balsamorhiza sagittata)* is found in patches on these warm and sunny south-facing slopes, where soils are locally deep enough to support this species. On very shallow or rocky soils, Idaho fescue and bluebunch wheat grass (*Agropyron spicatum),* typical of the Palouse prairie to the south (Tisdale 1947), become predominant, and cover of juniper and bearberry cover can be significant. Growth of Kentucky bluegrass is not favoured by the dry conditions at these sites.

Willoughby et al (1996) described a similar Idaho fescue - Parry oatgrass - Rough fescue community type on fairly dry upper slopes throughout the Montane.

Community Type: Parry oatgrass - Rough fescue - Idaho fescue	
Moisture regime: Submesic	Nutrient regime: mesotrophic
Soil type: Orthic Melanic Brunisol	Soil drainage: well
Parent materials: sandy-textured till	Sites: #01

Key and indicator species:	

Scientific name		Common name	Canopy cover (%)
Shrubs:	*Potentilla fruticosa*	Shrubby cinquefoil	1
Forbs:	*Anemone patens*	Prairie crocus	2
	Arnica fulgens	Shining arnica	5
	Gaillardia aristata	Gaillardia	3
	Lupinus sericeus	Perennial lupine	3
	Geum triflorum	Three-flowered avens	1
	Zigadenus venenosus	Death camas	2
	Lomatium triternatum	Western wild parsley	1
	Lithospermum ruderale	Woolly gromwell	1
	Balsamorhiza sagittata	Balsam-root	2
Graminoids:	*Danthonia parryi*	Parry oat grass	30
	Festuca idahoensis	Idaho fescue	20
	Festuca campestris	Rough fescue	10
	Agropyron spicatum	Bluebunch wheat grass	10
	Agropyron dasystachyum	Northern wheat grass	2
	Stipa columbiana	Columbia needle grass	1
	Koeleria macrantha	June grass	5

Bluebunch wheat grass - Idaho fescue (gr3)

The bluebunch wheat grass-Idaho fescue community type is characteristic of subxeric, submesotrophic thin soils, often shallow to bedrock. The site sampled was on a steep, eroded south-facing slope. This grassland community type is similar to, but drier than, the Parry oatgrass - Idaho fescue - rough fescue type described above. Species indicative of dry conditions include moss phlox (*Phlox hoodii)*, prairie selaginella (*Selaginella densa)*, yellow umbrella-plant (*Eriogonum flavum)* and prairie onion (*Allium textile)*, as well as the prostrate shrubs, common bearberry and juniper. Bluebunch wheat grass is a grass species typical of dry open slopes, found in Alberta only in the southwest part of the province. However, it is abundant in the dry interior of southern British Columbia (Tisdale 1947).

Two significant plant species, included on the Alberta Watch list (ANHIC 1996) occurred in this community, large-flowered beardtongue (*Penstemon lyallii)* and crested beardtongue (*Penstemon eriantherus)*.

Community Type: Bluebunch wheat grass - Idaho fescue	
Moisture regime: subxeric	Nutrient regime: submesotrophic
Soil type: Orthic Regosol	Soil drainage: well to rapid

Community Type: Bluebunch wheat grass - Idaho fescue	
Parent materials: colluvial	Sites: #04

Key and indicator species:			
Scientific name		**Common name**	**Canopy cover (%)**
Shrubs:	*Potentilla fruticosa*	Shrubby cinquefoil	2
	Juniperus horizontalis	Creeping juniper	2
	Arctostaphylos uva-ursi	Common bearberry	1
Forbs:	*Lepidium densiflorum*	Common pepper-grass	8
	Selaginella densa	Prairie selaginella	20
	Galium boreale	Northern bedstraw	8
	Anemone patens	Prairie crocus	1
	Lithospermum ruderale	Woolly gromwell	2
	Erigeron caespitosus	Tufted fleabane	2
	Penstemon eriantherus	Crested beardtongue	1
	Penstemon lyallii	Large-flowered beardtongue	1
	Allium textile	Prairie onion	1
	Eriogonum flavum	Yellow umbrella-plant	1
	Heterotheca villosa	Golden aster	1
	Phlox hoodii	Moss phlox	1
	Linum lewisii	Wild blue flax	1
	Comandra umbellata	Bastard toadflax	1
Graminoids:	*Agropyron spicatum*	Bluebunch wheat grass	10
	Festuca idahoensis	Idaho fescue	8
	Agropyron trachycaulum	Slender wheat grass	7
	Koeleria macrantha	June grass	5
	Carex filifolia	Thread-leaved sedge	5
	Stipa columbiana	Columbia needle grass	1
	Poa sandbergii	Sandberg bluegrass	1

4.2.4 Disturbance Communities

Timothy - Kentucky bluegrass - smooth brome (cd1)

One disturbance community was intensively sampled in this study. This was a grassy meadow dominated by the tame grass species, timothy (*Phleum pratense)*, Kentucky bluegrass and smooth brome (*Bromus inermis)*. Several other weedy species were also noted, including common dandelion (*Taraxacum officinale)*, common nettle (*Urtica dioica)*, stinkweed (*Thlaspi arvense)* and tall buttercup (*Ranunculus acris)*. Old log piles were found adjacent to the meadow, suggesting that a historical logging or milling operation existed here.

There are several other types of disturbance communities in the park. Cultivated lawn areas are

associated with park facilities. A field in the northwest corner of the park was cultivated prior to its inclusion in the park, and seeded to smooth brome and timothy. Extensive patches of Canada thistle (*Cirsium arvense)* occur along the intermittently flooded drawdown zone along the shoreline of Beauvais Lake. No detailed data was collected in these communities.

Community Type: Timothy - Kentucky bluegrass - smooth brome	
Moisture regime: mesic	Nutrient regime: permesotrophic
Soil type: Orthic Dark Gray Chernozem	Soil drainage: well
Parent materials: fluvial veneer over till	Site: #30

Key and indicator species:			
Scientific name		**Common name**	**Canopy cover (%)**
Shrubs:	*Symphoricarpos albus*	Snowberry	3
	Rubus idaeus	Wild red raspberry	2
	Sambucus racemosa	Red elderberry	1
	Ribes oxyacanthoides	Northern gooseberry	1
Forbs:	*Taraxacum officinale*	Common dandelion	8
	Cirsium arvense	Canada thistle	5
	Hackelia jessicae	Jessica's stickseed	1
	Aster conspicuus	Showy aster	5
	Urtica dioica	Common nettle	3
	Thlaspi arvense	Stinkweed	1
	Ranunculus acris	Tall buttercup	1
Graminoids:	*Phleum pratense*	Timothy	30
	Poa pratensis	Kentucky bluegrass	20
	Bromus inermis	Smooth brome	10

4.2.5 Wetlands

Shrubby wetland meadow (willow/grass -sedge) (wt1)

The shrubby wetland meadow is typical of the perimeter or edges of wetland areas. Moisture regimes fluctuate within this community type. However, there is less standing water in the wet meadows than in the sedge wetlands and other aquatic emergents community types. Wet meadow communities in the study area are found in association with beaver ponds, Chipman Creek and the extensive shallow shoreline areas at the east and west ends of Beauvais Lake. It is also found near the two ponds northwest of the campground, where a series of relic beaver dams

has been colonized by alternating willow/grass, and willow/grass - sedge communities.

Bluejoint (*Calamagrostis canadensis)* is common in this community, and there is a wide diversity of forbs. In the drier portions of wet meadow communities, blue camas (*Camassia quamash)*, a rare plant species, as well as several orchid species, are found.

These wetland meadow communities provide excellent animal habitat. The willows at the sites investigated in 1997 were extensively browsed. Also, a black bear was observed at one of the sites.

Community Type: Shrubby wetland meadow; Willow / grass - sedge	
Moisture regime: hygric to subhydric	Nutrient regime: permesotrophic to eutrophic
Soil type: Orthic Humic Gleysol	Soil drainage: poorly
Parent materials: lacustrine, fluvial	Sites: #32, 35a, 45a, 45f

Key and indicator species:

	Scientific name	Common name	Canopy cover (%)
Shrubs:	*Salix bebbiana*	Beaked willow	10
	Salix lucida	Shining willow	3
	Salix pseudomonticola	False mountain willow	2
Forbs:	*Cicuta maculata*	Water-hemlock	4
	Mentha arvensis	Wild mint	5
	Equisetum arvense	Common horsetail	5
	Geum rivale	Purple avens	3
	Geum macrophyllum	Large-leaved yellow avens	3
	Allium schoenoprasum	Wild chives	2
	Senecio foetidus	Marsh butterweed	2
	Cirsium arvense	Canada thistle	1
	Sparganium angustifolium	Narrow-leaved bur-reed	4
	Camassia quamash	Blue camas	2
	Habenaria saccata	Slender bog orchid	1
Graminoids:	*Carex utriculata*	Beaked sedge	7
	Carex atherodes	Awned sedge	5
	Carex bebbii	Bebb's sedge	3
	Scirpus validus	Common great bulrush	3
	Juncus balticus	Wire rush	3
	Calamagrostis canadensis	Bluejoint	10
	Eleocharis palustris	Creeping spike-rush	5
	Glyceria grandis	Common tall manna grass	5
	Glyceria borealis	Northern manna grass	5

Water sedge – beaked sedge (Sedge wetland) (wt2)

Whereas soils in the willow/ grass - sedge community are typically Orthic Humic Gleysols, the sedge-dominated community occurs on Humic Regosols developed in lacustrine sediments. About 10 to 20 % of the ground surface is represented by open water in this hydric community. In these wet conditions, the most common sedges were water sedge (*Carex aquatilis)* and beaked sedge (*Carex utriculata)*. A high cover of beaked sedge indicates a nitrogen-rich environment (Willoughby et al 1996). Floating-leaved aquatic plant species were also noted in this community.

Community Type: Water sedge - beaked sedge (sedge wetland)	
Moisture regime: hydric	Nutrient regime: eutrophic
Soil type: Humic Regosol	Soil drainage: very poorly
Parent materials: lacustrine	Sites: 35b,45b

Key and indicator species:			
Scientific name		**Common name**	**Canopy cover (%)**
Forbs:	*Sparganium minimum*	Slender bur-reed	1
	Lemna minor	Common duckweed	10
	Veronica americana	American brooklime	2
	Utricularia vulgaris	Common bladderwort	2
	Equisetum fluviatile	Swamp horsetail	8
Graminoids:	*Carex aquatilis*	Water sedge	40
	Carex utriculata	Beaked sedge	30
	Juncus balticus	Wire rush	5
	Glyceria striata	Fowl manna grass	1

Deep water emergents (swamp horsetail, common great bulrush, sedges, cattail) (wt3)

It was not possible to intensively sample these community types because of the water depth. However, extensive stands dominated by swamp horsetail (*Equisetum fluviatile)* occur in shallow waters at the east and west ends of Beauvais Lake, as well as in deeper areas of one of the beaver ponds. Patches of other aquatic emergents, namely cattail (*Typha latifolia)* and common great bulrush (*Scirpus validus)*, are frequent in the deeper waters along the shorelines of Beauvais Lake and in the ponds.

4.3 Significant Natural Features

4.3.1 Significant Flora

At least 20 rare plant species have been recorded in the study area in this study or by previous workers (Table 2). In addition, some very large douglas-fir trees occur in the study area, and their significance is discussed in Section 4.3.3.

The primary source used to determine the status of plant species found in the study area was ANHIC (Alberta Natural Heritage Information Centre) (1996), a list of provincial species of special concern. Species are ranked based primarily on number of occurrences, with consideration also given to distribution and current threats to populations. These ranking classes

Table 2. Significant plant species recorded at Beauvais Lake Provincial Park. Definitions of ANHIC (1996) Ranking Codes are given in Appendix F.

Species	Common name	Ranking (ANHIC)
On Tracking List :		
Camassia quamash var quamash	Blue camas	S2
Carex backii	Back's sedge	S2
Carex raynoldsii	Raynold's sedge	S2
Cypripedium montanum	Mountain lady's-slipper	S2
Danthonia californica	California oat grass	S?
Melica subulata	Alaska onion grass	S2
Orobanche uniflora	One-flowered cancer-root	S2S3
Phacelia hastata	Silver-leaved scorpionweed	S2
Pinus monticola	Western white pine	SU
Polygonum watsonii	Watson's knotweed	S2
Potamogeton natans	Floating-leaf pondweed	S2
Ranunculus uncinatus	Hairy buttercup	S2
On Watch list:		
Angelica dawsonii	Yellow angelica	S3
Bromus vulgaris	Woodland brome	S3
Calochortus apiculatus	Mariposa lily	S3
Osmorhiza occidentalis	Western sweet cicely	S3
Penstemon eriantherus	Crested beardtongue	S3
Penstemon lyallii	Large-flowered beardtongue	S3
Pinus flexilis	Limber pine	S4
Sedum stenopetalum	Narrow-petalled stonecrop	S3

(e.g. S1, S2) are summarized in Appendix F. Rare plant species of highest management priority are those included in the Tracking List, followed by those on the Watch List (Table 2). Several other species recorded in the study area, though not on the Alberta Tracking or Watch lists, are also of interest because they are restricted to southwest Alberta, or they occur in small numbers wherever they grow (Wallis et al 1986 and 1987, Fairbarns et al 1987). However, only those plant species on the Alberta Tracking or Watch Lists are discussed below.

Information on the status, habitat requirements and occurrence of the significant plant species recorded in the study area are given below. Because of the sensitivity of many of the sites supporting significant flora, the exact location of the significant floral features is purposely excluded from Map 2. Complete records of specific rare plant observations are maintained in the ANHIC database, Edmonton.

1) *Angelica dawsonii* S. Watts (Yellow angelica)
Status: On Alberta Watch List; ranked S3 (ANHIC 1996); restricted southwest Alberta range, but not uncommon (Wallis et al 1986);
Habitat: moist meadows and woods along streams; flowers late June
Occurrence: recorded this study (1997), and other studies (Alberta Parks 1990); fairly common

2) *Bromus vulgaris* (Hook.) Shear (Mountain brome)
Status: On Alberta Watch List; ranked S3 (ANHIC 1996); southwest Alberta distribution in Montane and Foothills Parkland habitats north to Crowsnest Pass area (Wallis et al 1986)
Habitat: Moist meadows and open woodlands at lower and middle elevations
Occurrence: found this study (1997) in open aspen woods

3) *Calochortus apiculatus* Baker (Mariposa lily)
Status: S3 on Alberta Watch List (ANHIC 1996); uncommon in Alberta, with only a few mapped locations (Moss 1983); found only in the southwest part of the province;
Habitat: dry slopes; distribution includes southeast British Columbia
Occurrence: recorded in the study area in 1997

4)*Camassia quamash* (Pursh) Greene *var. quamash* (Blue camas)
Status: S2 on Alberta Tracking List; found only in the southwest part of the province; moderately threatened due to habitat loss (ANHIC 1996)
Habitat: wet meadows
Occurrence: several records in the study area (1997; Alberta Parks 1990);

5) *Carex backii* Boott (Back's sedge)
Status: S2 on Alberta Tracking List (AHNIC 1996);
Habitat: dry shady woods
Occurrence: recorded this study (1997)

6)*Carex raynoldsii* Dewey (Raynold's sedge)
Status: S2 on Alberta Tracking List (ANHIC 1996); found only in southwest Alberta and the

Cypress Hills (Moss 1983);
Habitat: moist, open or wooded slopes (Moss 1983); moist grassland
Occurrence: recorded this study (1997) in moist grassland

7)*Cypripedium montanum* Dougl. *ex.* Lindl. (Mountain lady's-slipper)
Status: S2 on Alberta Tracking List
Habitat: Moist woods (Moss 1983)
Occurrence: recorded in ANHIC database;

8) Danthonia californica Boland (California oat grass)
Status: On Alberta Tracking List- status unknown; includes *D. intermedia* (Moss 1983)
Habitat: dry to moist open areas;
Occurrence: found this study (1997) on a gravelly river terrace along Mill Creek

9)*Melica subulata* (Griseb.) Scribn. (Alaska onion grass)
Status: S2 on Alberta Tracking List (ANHIC 1996);
Habitat: moist deciduous woodland
Occurrence: recorded this study (1997)

10)*Orobanche uniflora* L. (One-flowered cancer-root)
Status: S2S3 on Alberta Tracking List (ANHIC 1996);
Habitat: Parasite on various plants (e.g.*Sedum*; Saxifragaceae - Kuijt 1992); up to 2300 m elevation
Occurrence: recorded this study (1997) on a slope in the proposed park addition (NW19)

11) *Osmorhiza occidentalis* (Nutt.) Torr. (Western sweet cicely)
Status: S3 on Alberta Watch List (ANHIC 1996); in Alberta found only in the southwest corner
Habitat: Montane woods
Occurrence: recorded this study (1997) - occasional at sites in moist woods; also recorded in previous studies (Alberta Parks 1990; Crack and Danielson 1974)

12) *Penstemon eriantherus* Pursh (Crested beardtongue)
Status: S3 on Alberta Watch List (ANHIC 1996);
Habitat: dry open slopes
Occurrence: recorded this study (1997), as well as in previous studies (Alberta Parks 1990, Crack and Danielson 1974) on a dry rocky ridge north of the lake

13) *Penstemon lyallii* A. Gray (Large-flowered beardtongue)
Status: S3 on Alberta Watch List (ANHIC 1996);
Habitat: rocky slopes
Occurrence: recorded this study (1997) on a bedrock outcrop southwest of the lake

14) *Phacelia hastata* Dougl. *ex.* Lehm. (Silver-leaved scorpionweed)
Status: S2 on Alberta Tracking List (ANHIC 1996);

Habitat: Dry slopes
Occurrence: recorded this study (1997) on a dry ridge; and in other studies (Alberta Parks 1990)

15) *Pinus flexilis* James (Limber pine)
Status: S4 on Alberta Watch List (ANHIC 1996); has a limited distribution in Alberta
Habitat: exposed rocky slopes and hilltops
Occurrence: limber pine stands are located on the dry rocky ridges in the park

16) *Pinus monticola* Dougl. *ex.* D. Don (Western white pine)
Status: SU on Alberta Tracking List (ANHIC 1996); in Alberta, only one single tree was reported in Waterton National Park, but it hasn't been relocated since the 1950s and may have succumbed to disease (Kuijt 1982). Occasional in British Columbia.
Habitat: Open rocky slopes
Occurrence: a single tree was found by a park ranger in the 1970s; the tree was checked in 1997, and was producing a very heavy cone crop, as well as a few seedlings. See also Alberta Parks (1990).

17) *Polygonum watsonii* Small (Watson's knotweed)
Status: S2 on Alberta Tracking List (ANHIC 1996);
Habitat: moist meadows and flats;
Occurrence: last recorded June 1987 (ANHIC database)

18) *Potamogeton natans* L. (Floating-leaf pondweed)
Status: S2 on Alberta Tracking List (ANHIC 1996);
Habitat: open water;
Occurrence: last recorded July 1982 in Beauvais Lake (from ANHIC database)

19) *Ranunculus uncinatus* D. Don (Hairy buttercup)
Status: S2 on Alberta Tracking List (ANHIC 1996);
Habitat: moist woodland
Occurrence: recorded this study (1997) in moist deciduous woods

20) *Sedum stenopetalum* Pursh (Narrow-petalled stonecrop)
Status: S3 on Alberta Watch List (ANHIC 1996);
Habitat: dry open rocky slopes (Moss 1983)
Occurrence: recorded in 1989 (Alberta Parks 1990); this observation may have been *Sedum lanceolatum*, which grows in similar habitat; the two species sometimes grow together (Kuijt 1992); (requires confirmation);

4.3.2 Significant Fauna

Table 3 presents a list of faunal species which are of special management concern, their status and occurrence in the study area. Appendix G gives the evaluation systems used to determine status of the species listed. A total of 26 animal species found in the study area have been recognized by provincial and/or national authorities as species of concern. These include one red-listed species, 3 blue-listed species, 13 yellow A-listed species, and 10 yellow B-listed species (Table 3; Alberta Environ. Prot. 1996). Detailed information on preferred habitat and distribution in the province is given in other references (Russell and Bauer 1993; Semenchuk 1992; Smith 1994).

The species of highest management priority in the study area is the one 'red-listed' species, the northern leopard frog (*Rana pipiens)*. This species was observed several times in wet areas of the Park in the 1970s (Crack and Danielson 1974). However, the species has experienced dramatic population declines since that time, and has apparently disappeared from much of its former range in Alberta (Alberta Environ. Prot. 1996). It is imperative that remaining breeding wetlands are protected. The status of this species in the study area in 1997, and whether breeding populations still exist, is unknown.

Fauna species of next greatest management concern in the study area are those classified as threatened (COSEWIC 1996) or 'blue-listed' (Alberta Environ. Prot. 1996). These include the spotted frog (*Rana pretiosa)*, the short-eared owl (*Asio flammeus)* and the grizzly bear (*Ursus arctos)* (Table 3). The population status of the spotted frog is unknown, but this species has an extremely limited distribution, and populations may be in decline because of loss of habitat (Alberta Environ. Prot. 1996). The short-eared owl also experienced declines in all prairie provinces, although causes of the population decline are unknown. This species utilizes edges of larger wetlands for feeding and breeding habitat (Alberta Environ. Prot. 1996). The grizzly bear, an infrequent visitor to the park, is threatened by habitat loss and degradation of wilderness habitats.

Bull trout (*Salvelinus malma)* is also a species of concern. Remaining populations of this native trout are considered at serious risk of extirpation (Berry 1994). The species is slow maturing, and harvesting of immature fish may be one cause of the population decline (D. Wigg, Alberta Fisheries Mgmt., Blairmore, pers. comm.). Mature bull trout utilize the upper reaches of Mill Creek for spawning, and migrate through the study area (where the creek flows through the west end of the Park) to get to the spawning grounds each fall. After spawning is complete, a reverse migration occurs, but most mature bull trout probably do not stay within the Park study area. However, young and juvenile fish may be resident in Mill Creek within the study area (D. Wiig, pers. comm.). Both the migrant and possible resident fish must be protected from park activities that affect flow or water quality in Mill Creek.

Many of the animal species listed in Table 3 nest or breed in the study area.

Table 3. Significant faunal species recorded at the Beauvais Lake Provincial Park study area. Definitions of status codes are given in Appendix F (Alberta Environ. Prot. 1996; COSEWIC 1996).

Common Name	Latin Name	Status	Study Area Records (Crack and Danielson 1974; Alberta Parks 1990; this study)
Birds			
Red-necked grebe	*Podiceps grisegena*	Yellow A-listed	nests in emergent vegetation on the lake
American bittern	*Botaurus lentiginosus*	Yellow A-listed	uncommon resident
Great blue heron	*Ardea herodias*	Yellow B-listed	summer resident
Osprey	*Pandion haliaetus*	Yellow B-listed	summer resident
Golden eagle	*Aquila chrysaetos*	Yellow B-listed	occasional visitor
Northern harrier	*Circus cvaneus*	Yellow A-listed	summer resident
Prairie falcon	*Falco mexicanus*	Yellow A-listed; ANHIC tracking list - S3	infrequent visitor
Sharp-tailed grouse	*Typanuchus phasianellus*	Yellow A-listed	infrequent resident in grasslands
Black tern	*Chlidonias niger*	Yellow A-listed	fairly common resident; nests in emergent vegetation in the lake
Short-eared owl	*Asio flammeus*	Blue-listed - declines in all prairie provinces; relies on wetland edges: COSEWIC list - vulnerable;	infrequent (observations 1986, 1987)
Barred owl	*Strix varia*	Yellow B-listed; uncommon and declining	nested in the park in 1997 (H. Eidjel, park naturalist, pers. comm.)
Great gray owl	*Strix nebulosa*	Yellow B-listed; needs mature forests for breeding	infrequent
Pileated woodpecker	*Dryocopus pileatus*	Yellow B-listed	uncommon summer resident
Clark's nutcracker	*Nucifraga columbiana*	Yellow B-listed	uncommon summer resident
Western tanager	*Piranga ludoviciana*	Yellow B-listed	uncommon summer resident
Clay-coloured sparrow	*Spizella pallida*	Yellow A-listed	occasional at habitat edges

Common Name	Latin Name	Status	Study Area Records (Crack and Danielson 1974; Alberta Parks 1990; this study)
Mammals			
Badger	*Taxidea taxus*	Yellow A-listed	occasional resident
Long-tailed weasel	*Mustela frenata*	Yellow A-listed	occasional resident
Cougar	*Felis concolor*	Yellow B-listed	rare visitor
Bobcat	*Lynx rufus*	Yellow B-listed	rare visitor
Grizzly bear	*Ursus arctos*	Blue-listed; COSEWIC list - vulnerable	rare visitor
Amphibians:			
Northern leopard frog	*Rana pipiens*	Red-listed; previously common and widespread, but has disappeared from most of its range in Alberta; protection of remnant breeding areas essential	recorded 1974
Spotted frog	*Rana pretiosa*	Blue-listed; extremely limited distribution, possible declines;	several recorded in 1974
Reptiles:			
Red-sided garter snake	*Thamnophis sirtalis*	Yellow A-listed	occasional resident
Fish			
Bull trout	*Salvelinus malma*	species of concern (Berry 1994)	spawning migrant; possibly resident in Mill Creek within the study area; (D. Wiig, Alberta Fish Management Div., Blairmore)

4.3.3 Significant Landscape or Habitat Features

Significant landscape features, habitats or areas supporting significant flora or fauna, are shown on Map 2. Because few areas of ungrazed upland and wetland habitats exist in the Montane in Alberta, all of Beauvais Lake Provincial Park has been rated as provincially significant (Cottonwood Consultants 1987). The incredible diversity of natural features also contributes to the high significance rating. However, within different portions of the study area, the resource values vary. The characteristics of each significant area are summarized below.

A. Bedrock Outcrops

- there are several good sandstone bedrock exposures of lower Cretaceous age
- fossils can be found in some of the bedrock outcrops;
- bedrock outcrops in the area proposed for acquisition support a good example of a young fire-successional lodgepole pine forest;

B. Dry Upland Slopes and Ridges

- the high points of these ridges provide excellent picturesque views of surrounding prairies, the southwest foothills environs and of the lake itself; one of the best panoramic views is provided in the area proposed for possible park expansion, south of the park;
- diverse grassland and forest ecotones support rare plants as well as many plants restricted to southwest Alberta; the expansion area south of the park contains some species typical of subalpine habitats;
- limber pine, included on the 1996 Alberta Watch List (ANHIC 1996), grows in this terrain;
- this is a sensitive habitat; soils are thin, and many plants are matted, with shallow root systems;

C. Upland Meadows; Fescue Grasslands

- fescue grasslands that are ungrazed are uncommon in the Alberta Montane (Cottonwood Consultants 1987)
- support numerous rare plants, and plants restricted to southwest Alberta
- important elk and mule deer habitat; key elk wintering grounds; for example, an upland meadow west of the lake is heavily used by elk in winter especially during periods of heavy snowfall (A. Heschl, Alberta Parks, Blairmore, pers.comm.; Woerns 1979);

D. Old growth Conifers

i) Old-growth forests

- steep north-facing slopes in some parts of the study area support a forest overstory of large mature douglas-fir and white spruce; these areas have received less disturbance than other parts of the park, and apparently escaped intensive logging. Because of the mature forest canopy, conditions on the forest floor are very different from most of the park's forests, and this is an interesting and valuable plant community.
- some of the old-growth forest stands support some very large individual douglas-fir trees; these are significant features in themselves (see below)

- several rare plants are found in this community: Alaska onion grass (*Melica subulata* – on Tracking List) , woodland brome (*Bromus vulgaris* – on Watch List) and yellow angelica (*Angelica dawsonii* – on Watch List) (ANHIC 1996);
- because these slopes are isolated from the developed areas of the park, they provide a valuable wildlife refuge and hiding habitat; signs of bear were recorded (bear scat; broken stumps);

ii) Individual Old Douglas-fir trees

- these significant features are found both as scattered individual trees within more open areas or within young aspen woodlands; and within conifer stands;
- douglas-firs were largely removed by logging from much of the park and although douglas-fir regeneration was recorded, only a few large old-growth trees remain and are scattered; these individual trees have survived both logging and fire;
- one tree found in an old-growth conifer stand was over 1.25 m in diameter, and estimated to be about 300 years old (Dr. P. Murphy, Forestry Professor Emeritus, Univ. of Alberta, pers. comm.)(although no increment boring was done). Thus the last intense fire at this site would have been about the year 1697.
- another tree in the study area was estimated to be about 1.8 m in diameter; however, no precise measurement was taken and further study is required. It is recommended that this tree be measured for ranking among the largest and/or oldest douglas-fir in the province; (the biggest recorded tree in the province until recently was a douglas-fir 1.64 m (5'4") in diameter, and the oldest tree on record in the province is more than 600 years old (Dr. Peter Murphy, pers. comm.).

E. Mill Creek Valley

- steep-sided valley with bedrock outcrops of geological interest
- diverse Montane plant communities, including mature douglas-fir - white spruce, mixed forests and poplar forests, shrublands and grassland
- supports some old-growth douglas-fir, which have survived historic fires and logging and which may be hundreds of years old
- several springs support uncommon plant species
- wide diversity of breeding bird habitats
- the canyon cliffs provide suitable nesting and hunting habitat for rare and uncommon birds such as golden eagle (*Aquila chrysaetos*) and prairie falcon (*Falco mexicanus)*(both Yellow-listed species) (Alberta Environ. Prot. 1996)
- key white-tailed deer habitat (Cottonwood Consultants 1987)
- migration route for spawning bull trout

F. Relic Beaver Ponds

- excellent sequence of old beaver dams showing successional growth of communities in flooded areas;
- habitat is available for a diversity of birds because of the variety of vegetation types and the

large extent of wetland and edge habitat; Canada geese (*Branta canadensis)* have nested here (Alberta Parks 1990);

- a favourite moose habitat, due to the abundance of willows, a good browse plant (Stelfox 1980); also, since somewhat less human disturbance occurs here than on the lake;
- in the 1970s, Beauvais Lake Provincial Park was one of the few areas in the province where the distribution of leopard frogs and spotted frogs overlapped (Cottonwood Consultants 1987). However, both species have experienced dramatic population declines (Alberta Environ. Prot. 1996). The status of these species within the study area is unknown, and further study is recommended. It is possible that undisturbed marshes and shallow wetland areas in the Park could support populations of these species; thus wetlands (beaver ponds, flooded areas and wet meadows) should be considered valuable and sensitive habitats with high management priority.

G. Deep Marsh

- along lake shoreline and deeper parts of ponds
- aquatic emergent vegetation provides nesting and feeding habitat for aquatic birds such as red-necked grebes (*Podiceps grisegena)*, great blue herons (*Ardea herodias)* and bitterns (*Botaurus lentiginosus)*, all of which are considered species of concern;
- excellent waterfowl production area, for diving ducks, puddle ducks, Canada geese (*Branta canadensis);*
- one aquatic plant species included on the Tracking List (ANHIC 1996) has been recorded in the lake: floating-leaf pondweed (*Potamogeton natans)*;
- the drowned forest (snags) along the flooded shoreline at the east end of the lake provide a substantial amount of underwater surface area for aquatic insects and algae, which are important in the food chain;

  -snags also provide habitat for cavity-nesting birds, such as barrow's goldeneye (*Bucephala islandica)*, which nested at the lake in 1987 (Janecke 1987), and pileated woodpeckers (*Dryocopus pileatus)*;

  -other birds which utilize snags are osprey (*Pandeon haliaetus),* which were observed regularly in 1997 feeding at the lake (H.Eidjel, park naturalist, pers. comm), and kingfishers (*Ceryle alcyon*).

H. Wet Meadows

- the best example is located between the campground and the west shore of the lake.
- a variety of moisture-loving plants thrives here, including blue camas (*Camassia quamash)*, a species on the 1996 Tracking List (ANHIC 1996), and orchid species (*Habenaria* spp.)
- prime moose habitat;
- the spotted frog (*Rana pretiosa)* was recorded in this area in 1974 (Crack and Danielson 1974; Alberta Parks 1990);
- supports breeding populations of several bird species which prefer to nest in wetland edge habitats, including common snipe (Gallinago gallinago), sora rail (Porzana carolina), red-winged blackbird (Agelaius phoeniceus), common yellowthroat (Geothlypis trichas), and northern waterthrush (Seiurus noveboracensis).

5.0 SUMMARY AND RECOMMENDATIONS

Beauvais Lake Provincial Park supports such a diverse assemblage of flora and fauna that the entire Park has been rated as provincially significant (Cottonwood Consultants 1987). In addition, a large number of significant species have been found within the Park, including 20 plant species on the ANHIC Tracking or Watch lists (ANHIC 1996), and 26 fauna species considered of special management concern (Alberta Environ. Prot. 1996; COSEWIC 1996). However, resource values vary in different areas of the Park, and greatest management priority should be given to significant landscape features and areas that support significant plant or animal species.

Several very old douglas-fir trees, likely hundreds of years old, occur in the Park. Both the individual trees and the old-growth forests in which they are found deserve special protection. Protection should include avoiding park development activity which may directly or indirectly impact these old-growth forests. In addition, the full extent of old-growth douglas-fir in the study area should be examined and mapped.

The western white pine site must also be protected as a special feature. In addition, the site should be monitored for the presence of white pine blister rust. Small seedlings which were observed during the course of this study must be protected from damage by trampling or other use.

The bedrock outcrops and dry upland slopes and ridges are also significant landscape features, which support plant species of concern such as the limber pine. Formal park developments in these areas must be avoided.

Potential breeding wetlands for frog species must be protected. The red-listed northern leopard frog was observed in the study area in 1974, but apparently not recorded since. The status of this and another rare frog species, the spotted frog, within the study area is unknown, and further study is recommended. Park naturalists should learn to recognize the calls of this species in order to document possible future occurrences. Undisturbed shallow wetlands in the Park have the potential to support these species, so wetland areas such as beaver ponds, shallow flooded areas and wet meadows should be given high protection.

Mill Creek, at the western edge of the study area, supports for at least part of the year a population of another species of concern, the bull trout. Young and juvenile fish may reside in the creek within the study area, and migrating trout pass during spawning. Thus, managers must ensure protection of these waters from activities that affect flow or water quality in Mill Creek.

As the status of flora and fauna species is continually updated, periodic inventory of the plant and animal assemblages in the Park is recommended. New species of concern may be located, or species status may change so that management priority is altered. Park managers should be aware of the locations of significant features in order to allow active and effective protection.

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APPENDIX A. Map 1 polygon database - Beauvais Lake Provincial Park study area.

POLY.[1]	PM[2]	SOIL1[3]	SOIL2[3]	MOIST.[4]	NUTR.[4]	VEG[5]
1	GF1	O.GL		4	4	e2
2	L2	H.R	GL.HR	8	5	wt2
3	L2	H.R		8	5	wt3
4	L1	GL.BL		5	4	e2
5	F1	D.GL		4	3	d3
6	F1	O.HG		7	5	wt1
7	M2	O.BL		4	3	cd1
8	M2	O.DG	O.HG	5	4	e2
9	M2	O.BL		4	4	gr1
10	L1	GL.BL	O.BL	4	4	cd1
11	L2	H.R		8	5	wt3
13	L1	GL.BL		4	4	f1
14	GF1	O.DG		5	4	e2
15	GF1	O.DG		4	4	e3
16	GF1	O.DG		5	4	e3
17	GF1	O.DG		5	4	gr
18	GF1	O.DG	O.GL	4	4	e3
19	L1	O.BL		5	4	cd1
20	L1	GL.BL	O.BL	4	3	sh1
21	L2	H.R		4	4	wt3
22	M2	O.BL	O.DG	8	5	e2
23	M1	O.MB		4	3	gr3
24	F3	O.BL		2	2	sh1
25	M2	O.DG		4	4	gr2
26	CX1	O.R lithic		4	3	gr3
27	M3	O.BL		2	2	gr1
28	M2	O.DG		4	4	e2
29	M1	O.MB		4	4	d1
30	M1	O.MB lithic	O.R	4	3	a1
31	M2	O.DG		3	3	c3

POLY.[1]	PM[2]	SOIL1[3]	SOIL2[3]	MOIST.[4]	NUTR.[4]	VEG[5]
32	F3	O.DG	GL.HR	4	3	g1
33	F3	GL.DG		5	4	d3
34	MC1	O.EB		5	3	e3
35	M2	O.DG		4	3	b2
36	M1	O.DG		4	3	gr2
37	CX1	O.R	O.EB	4	3	a1
38	M2	O.DG	O.MB	2	2	gr2
39	M2	O.DG		3	3	e2
40	M3	O.BL		4-5	3-4	cd1
41	M2	O.DG		4	3	f1
42	F3	GL.HR		5	4	g2
43	M3	O.DG		5	4	e2
44	L2	H.R		4	4	wt1
45	L2	O.HG		8	5	wt3
46	F1	O.DG	GL.DG	7-8	4	g1
47	MC1	O.DYB	O.GL	5-6	4	d1
48	MC1	O.DYB	O.MB	4	2	e2
49	MC1	O.MBlithic		4	3-4	sh1
50	MC1	O.EBlithic		3	2	gr3
51	F1	O.DYB	O.HR	3	3	f1
52	M2	O.GL	D.GL	4-5	3-4	d1
53	M2	O.GL		4	4	e3
54	F1	O.DG	GL.DG	5	4	cd1
55	M2	O.GL	O.DG	5-6	4	f1
56	M2	O.DG	O.BL	5	4	e2
57	M2	O.GL		5	4	d1
58	GF2	O.BL		4	3	gr1
59	L2	O.HG	GL.HR	4	3	wt1
60	GF1	O.BL		7-8	5	cd1
61	L2	O.HG	H.R	4	3	wt2
62	L1	GL.HR		7	5	g1
63	GF2	O.BL		5	4	cd1
64	L2	H.R		4	3	wt2
65	GF2	O.BL		8	5	cd1

POLY.[1]	PM[2]	SOIL1[3]	SOIL2[3]	MOIST.[4]	NUTR.[4]	VEG[5]
66	M2	O.DG		4	3	d3
67	M2	O.GL		4	4	d1
68	MC1	E.DYB	O.R	4	3	c2
69	M1	O.DG		3	2	a1
70	M2	O.DG		3	3	e2
71	M2	D.GL	O.DG	4-5	4	d2
72	M2	O.GL		4	3	d3
73	M2	O.DG		4	3	c3
74	M2	O.GL		4	4	d3
75	F1	O.HG		4	3	g1
76	MC1	O.DYB		6	5?	c2
77	MC1	O.R		3	3	b1
78	CX1	O.R	O.EB	2	2	a1
79	CX1	O.R	O.EB	3	2	a1
80	MC1	O.EB		2	2	c1
81	M1	O.R	nonsoils	3	3	gr3
82	MC1	O.EB		1	1	c1
83	M1	D.GL		3	2	c3
84	MX1	O.R	O.EB	4	3	b1
85	MC1	O.MB	O.GL	1	2	d1
86	M2	D.GL	O.EB	4	3	d2
87	M2	D.GL		4	4	e2
88	M2	D.GL	O.DG	4	4	gr2
89	M2	D.GL		4	3	e1
90	M2	O.DG	D.GL	4	4	e2
91	M2	O.GL	D.GL	4	4	e3
92	M2	D.GL		4	4	d3
93	GF2	O.DG	D.GL	4	4	e2
94	MC1	O.EB		4	4	c1
95	L2	O.HG		3	2	wt3
96	F2	O.EB		8	5	c2
97	GF2	D.GL	O.DG	3	2	e2
98	MC1	O.EB		4	4	c1
99	GF2	O.GL	R.HG	3	2	e3

POLY.[1]	PM[2]	SOIL1[3]	SOIL2[3]	MOIST.[4]	NUTR.[4]	VEG[5]
100	M1	O.R	O.EB	4	4	b1
101	M1	O.DG	O.EB	1	2	c3
102	F2	O.EB	E.EB	4	3	b1
103	F2	O.EB		2-3	2-3	sh1
104	F2	O.EB		3	3	gr3
105	GF2	O.EB		3	2	c1

[1] POLY. - Polygon number on Map 1

[2] PM - Parent Materials Code - refer to APPENDIX B for details

[3] SOIL1, SOIL2 - dominant and secondary soils; codes for soil classification are from the Canadian System of Soil Classification (Canada Soil Survey 1987)

[4] MOIST.- moisture regime codes: 1- xeric, 2- subxeric, 3- submesic, 4-mesic, 5- subhygric, 6- hygric, 7- subhydric, 8- hydric;

NUTR. - nutrient regime codes: 1- oligotrophic, 2- submesotrophic, 3- mesotrophic, 4- permesotrophic, 5- eutropic, 6 - hypereutropic;

[5] VEG code - Vegetation Code and descriptions - refer to APPENDIX C for definitions

APPENDIX B. Descriptions of Parent Materials (PM) codes from Appendix A and Map 1 - Beauvais Lake Provincial Park study area.

PM UNIT CODE	PARENT MATERIALS	SOIL CLASS*	SLOPE CLASS	DRAINAGE CLASS	MOISTURE REGIME	NUTRIENT REGIME	VEGETATION - summary	SITES
MORAINE								
M1	Morainal veneer over ridged or inclined bedrock; some exposed bedrock	O.MB; E.DYB; O.R minor amounts of lithic O.DG, O.GL	6-8	Well to rapid	Subxeric to submesic	Submesotrophic to mesotrophic	Dry grassland, usually dominated by bluebunch wheatgrass, Idaho fescue and Parry oatgrass	1, 4,14a
M2	Inclined or hummocky till deposits;	D.GL; O.GL, O.DG	4-7	Well	Mesic	Permesotrophic	South-facing are rich fescue grassland; other areas are forested (mixed)	2,13, 15,17, 18,21, 28,29, 30, 31, 39
M3	Undulating, gently inclined and nearly level	O.BL; O.DG	2-4	Well to moderately well	Mesic	Mesotrophic to permesotrophic	Parkland - mosaic of aspen copses and grassland	34,44
MORAINE and COLLUVIAL								
MC1	Colluvial and morainal deposits over ridged or inclined bedrock; steep to very steep slopes; thick eolian deposits on some slopes	O.DYB; E.DYB O.EB;	6-8	Well	Submesic	Submesotrophic to mesotrophic	Predominantly: dry coniferous forest with poorly developed shrub layer; occasional patches of aspen or shrubby meadow	8,9, 10, 12, 16, 23,24, 27a, 40
COLLUVIAL and RESIDUAL								
CX1	Colluvial and saprolytic veneers over ridged and inclined bedrock; steep to very steep slopes; bedrock outcrops	O.R; O.EB and non-soils	6-8	Rapid	Xeric to submesic	Submesotrophic	Dry grassland, often with juniper and bearberry, and scattered limber pine and Douglas fir	3, 25, 26, 26a, 27
FLUVIAL								
F1	Fluvial veneers and blankets over till; deposited by intermittent streams; includes fluvial fan at southwest end of lake; soils damp	O.HG (dominant), R.G, GL.HR;	2-3	Imperfectly to poorly	Subhygric to hygric	Permesotrophic	Balsam poplar - white spruce woods; willows; some disturbed areas	11, 22, 32, 42

F2	Thick recent fluvial deposits overlying glaciofluvial sediments on narrow floodplain and terraces along Mill Creek valley;	O.EB (some buried soils); E.EB; minor amounts of D.GL; O.DG	6-10 on banks; 1-3 on terraces	Rapid to well	Subxeric to submesic	Submesotrophic to mesotrophic	Coniferous or mixed forest often with bearberry and/or juniper; areas of bare ground frequent	36, 37, 38
F3	Fluvial veneers and blankets over till; older fluvial deposits; soils not as damp as F1 soils	O.BL(dominant); O.DG; GL.DG; D.GL	2-4	Moderately well	Mesic to subhygric	Mesotrophic to permesotrophic	Shrubby forb meadows at warmer sites (south-facing); aspen, mixed or coniferous forest at cooler sites (north-facing)	5,6,33, 41, 43
LACUSTRINE								
L1	Lacustrine deposits over undulating till; older pond and lake sediments	GL.BL; GL.DG	1-2	Moderately well	Subhygric	Permesotrophic	Rich deciduous or mixed forest; small patches of forb-rich grassland	7
L2	Lacustrine deposits over undulating till; frequently flooded lake and pond sediments	O.HG & R.HG; some strongly calcareous; GL.HR	1-2	Poorly to very poorly	Hydric	Eutrophic	Grass-sedge or willow/grass-sedge; Aquatic vegetation: sedges, swamp horsetail, cattail and rushes; willow especially at wetland edges	35,45
GLACIOFLUVIAL								
GF1	Glaciofluvial deposits (stony ice-contact moraine) interspersed with undulating till deposits; cobbly coarse and medium textures	O.BL; O.DG	1-3	Well	Mesic	Permesotrophic	Parkland	---
GF2	Glaciofluvial and recent fluvial deposits on terraces along Mill Creek valley, a glacial outwash channel	O.DG	1-3	Well	Mesic	Permesotrophic	Mixed forest;	19,19b, 20

* codes for soil classification are from the Canadian System of Soil Classification (Canada Soil Survey 1987)

APPENDIX C. Vegetation mapping codes from Appendix A and Map 1, Beauvais Lake study area.

CODE	MOISTURE/NUTRIENT REGIMES	VEGETATION DESCRIPTION*
Forest vegetation		
a1*	subxeric/poor (submesotrophic)	limber pine/juniper Fd-Pf*
b1	submesic/poor (submesotrophic)	bearberry Pl
c1	submesic/medium (mesotrophic)	Canada buffaloberry/ hairy wild rye Fd
c2	submesic/medium (mesotrophic)	Canada buffaloberry/hairy wild rye Pl
d1	mesic/medium (mesotrophic)	white meadowsweet Fd
d2	mesic/medium (mesotrophic)	white meadowsweet Pl
d3	mesic/medium (mesotrophic)	white meadowsweet Sw
e2	mesic/rich (permesotrophic)	thimbleberry/pine grass Aw
e3	mesic/rich (permesotrophic)	thimbleberry/ pine grass Sw
f1	subhygric/rich (permesotrophic)	balsam poplar Pb
g1	hygric/rich (permesotrophic)	horsetail Sw-Pb
g2	hygric/rich (permesotrophic)	horsetail Sw
Shrubland		
sh1	mesic to subhygric/permesotrphic	shrubby forb meadow
Grassland		
gr1	mesic/permesotrophic	rough fescue - Kentucky bluegrass
gr2	submesic/mesotrophic	Parry oatgrass - rough fescue - Idaho fescue
gr3	subxeric/submesotrophic	bluebunch wheat grass - Idaho fescue
Disturbance community types		
cd1	mesic/permesotrophic	timothy-Kentucky bluegrass - smooth brome
Wetland community types		
wt1	hygric to subhydric/ permesotrophic to eutrophic	willow / grass- sedge (shrubby wetland meadow)
wt2	hydric / eutrophic	water sedge - beaked sedge (sedge wetland)
wt3	hydric/eutrophic	aquatic emergents (cattail, bulrush, horsetail)

* For forested areas, mapping codes and vegetation descriptions correspond to ecosite phases of Archibald et al (1996); codes for dominant overstory tree species are as follows: Aw - Aspen , Pb - Balsam poplar, Fd - Douglas fir, Pf - Limber pine, Pl - Lodgepole pine, Sw - White spruce

APPENDIX D. Scientific and common names of plant species observed at the Beauvais Lake Provincial Park study area in 1997.

Scientific Name	Common name	Family
Mosses:		
Hylocomium splendens	Stair-step moss	Hylocomiaceae
Mnium sp.	Moss	Mniaceae
Pleurozium schreberi	Schreber's moss	Hylocomiaceae
Ptilium crista-castrensis	Knight's plume moss	Hypnaceae
Graminoids:		
Agropyron albicans	Awned northern wheat grass	Gramineae
Agropyron dasystachyum	Northern wheat grass	Gramineae
Agropyron spicatum	Bluebunch wheat grass	Gramineae
Agropyron trachycaulum	Slender wheat grass	Gramineae
Bromus carinatus	Keeled brome	Gramineae
Bromus inermis	Smooth brome	Gramineae
Bromus vulgaris	Woodland brome	Gramineae
Calamagrostis canadensis	Bluejoint	Gramineae
Calamagrostis purpurascens	Purple reed grass	Gramineae
Calamagrostis rubescens	Pine grass	Gramineae
Carex aquatilis	Water sedge	Cyperaceae
C. atherodes	Awned sedge	Cyperaceae
C. backii	Back's sedge	Cyperaceae
C. bebbii	Bebb's sedge	Cyperaceae
C. disperma	Two-seeded sedge	Cyperaceae
C. filifolia	Thread-leaved sedge	Cyperaceae
C. lanuginosa	Woolly sedge	Cyperaceae
C. raynoldsii	Raynold's sedge	Cyperaceae
C. utriculata	Beaked sedge	Cyperaceae
C. sartwellii	Sartwell's sedge	Cyperaceae
C. siccata	Hay sedge	Cyperaceae
C. sprengelii	Sprengel's sedge	Cyperaceae
C. stenophylla	Low sedge	Cyperaceae
C. xerantica	White-scaled sedge	Cyperaceae
Dactylis glomerata	Orchard grass	Gramineae
Danthonia californica	California oat grass	Gramineae
Danthonia parryi	Parry oat grass	Gramineae

Scientific Name	Common name	Family
Deschampsia cespitosa	Tufted hair grass	Gramineae
Eleocharis palustris	Creeping spike-rush	Cyperaceae
Elymus canadensis	Canada wild rye	Gramineae
Elymus innovatus	Hairy wild rye	Gramineae
Festuca idahoensis	Idaho fescue	Gramineae
Festuca campestris	Rough fescue	Gramineae
Glyceria borealis	Northern manna grass	Gramineae
Glyceria grandis	Common tall manna grass	Gramineae
Glyceria striata	Fowl manna grass	Gramineae
Juncus balticus	Wire rush	Juncaceae
Koeleria macrantha	June grass	Gramineae
Melica subulata	Alaska onion grass	Gramineae
Phleum pratense	Timothy	Gramineae
Poa palustris	Fowl bluegrass	Gramineae
Poa pratensis	Kentucky bluegrass	Gramineae
Poa sandbergii	Sandberg bluegrass	Gramineae
Schizachne purpurascens	Purple oat grass	Gramineae
Scirpus validus	Common great bulrush	Gramineae
Stipa columbiana	Columbia needle grass	Gramineae
Stipa richardsonis	Richardson needle grass	Gramineae
Forbs, Ferns & Allies		
Achillea millefolium	Common yarrow	Compositae
Actaea rubra	Baneberry	Ranunculaceae
Agoseris glauca	Yellow false dandelion	Compositae
Allium cernuum	Nodding onion	Liliaceae
Allium schoenoprasum	Wild chives	Liliaceae
Allium textile	Prairie onion	Liliaceae
Anemone multifida	Cut-leaved anemone	Ranunculaceae
Anemone patens	Prairie crocus	Ranunculaceae
Angelica arguta	White angelica	Umbelliferae
Angelica dawsonii	Yellow angelica	Umbelliferae
Antennaria anaphaloides	Tall everlasting	Compositae
Antennaria parvifolia	Small-leaved everlasting	Compositae
Antennaria racemosa	Racemose everlasting	Compositae
Antennaria rosea	Rosy everlasting	Compositae
Apocynum androsaemifolium	Spreading dogbane	Apocynaceae

Scientific Name	Common name	Family
Aquilegia flavescens	Yellow columbine	Ranunculaceae
Arabis nuttallii	Nuttall's rock cress	Cruciferae
Arnica cordifolia	Heart-leaved arnica	Compositae
Arnica fulgens	Shining arnica	Compositae
Artemisia dracunculus	Dragonwort	Compositae
Artemisia frigida	Pasture sagewort	Compositae
Asclepias speciosa	Showy milkweed	Asclepiadaceae
Aster ciliolatus	Lindley's aster	Compositae
Aster conspicuus	Showy aster	Compositae
Aster laevis	Smooth aster	Compositae
Astragalus tenellus	Loose-flowered milk vetch	Leguminosae
Astragalus vexilliflexus	Few-flowered milk vetch	Leguminosae
Balsamorhiza sagittata	Balsamroot	Compositae
Calochortus apiculatus	Mariposa lily	Liliaceae
Camassia quamash	Blue camas	Liliaceae
Campanula rotundifolia	Harebell	Campanulaceae
Carum carvi	Caraway	Umbelliferae
Castilleja miniata	Common red paintbrush	Scrophulariaceae
Castilleja occidentalis	Lance-leaved paintbrush	Scrophulariaceae
Cerastium arvense	Field mouse-ear chickweed	Caryophyllaceae
Cicuta bulbifera	Bulb-bearing water-hemlock	Umbelliferae
Cicuta maculata	Water-hemlock	Umbelliferae
Cirsium arvense	Canada thistle	Compositae
Collomia linearis	Narrow-leaved collomia	Polemoniaceae
Comandra umbellata	Bastard toadflax	Santalaceae
Corallorhiza striata	Striped coralroot	Orchidaceae
Corallorhiza maculata	Spotted coralroot	Orchidaceae
Corallorhiza trifida	Pale coralroot	Orchidaceae
Cryptantha nubigena var celosioides	Clustered oreocarya	Boraginaceae
Cynoglossum officinale	Hound's-tongue	Boraginaceae
Cystopteris fragilis	Fragile bladder fern	Polypodiaceae
Delphinium bicolor	Low larkspur	Ranunculaceae
Disporum trachycarpum	Fairybells	Liliaceae
Dodecatheon conjugens	Mountain shooting star	Primulaceae
Dodecatheon pulchellum	Saline shooting star	Primulaceae

Scientific Name	Common name	Family
Epilobium angustifolium	Common fireweed	Onagraceae
Epilobium ciliatum	Northern willowherb	Onagraceae
Equisetum arvense	Common horsetail	Equisetaceae
Equisetum fluviatile	Swamp horsetail	Equisetaceae
Equisetum hyemale	Common scouring-rush	Equisetaceae
Equisetum laevigatum	Smooth scouring-rush	Equisetaceae
Equisetum pratense	Meadow horsetail	Equisetaceae
Equisetum scirpoides	Dwarf scouring-rush	Equisetaceae
Erigeron acris	Northern daisy fleabane	Compositae
Erigeron caespitosus	Tufted fleabane	Compositae
Erigeron compositus	Compound-leaved fleabane	Compositae
Erigeron glabellus	Smooth fleabane	Compositae
Erigeron peregrinus	Wandering daisy	Compositae
Erigeron speciosus	Showy fleabane	Compositae
Eriogonum flavum	Yellow umbrella-plant	Polygonaceae
Eriogonum umbellatum	Subalpine umbrella-plant	Polygonaceae
Erythronium grandiflorum	Glacier lily	Liliaceae
Fragaria virginiana	Wild strawberry	Rosaceae
Gaillardia aristata	Gaillardia	Compositae
Galium boreale	Northern bedstraw	Rubiaceae
Galium triflorum	Sweet-scented bedstraw	Rubiaceae
Geranium richardsonii	Wild white geranium	Geraniaceae
Geranium viscosissimum	Sticky purple geranium	Geraniaceae
Geum aleppicum	Yellow avens	Rosaceae
Geum macrophyllum	Large-leaved yellow avens	Rosaceae
Geum rivale	Purple avens	Rosaceae
Geum triflorum	Three-flowered avens	Rosaceae
Goodyera oblongifolia	Rattlesnake plantain	Orchidaceae
Habenaria dilatata	Tall white bog orchid	Orchidaceae
Habenaria hyperborea	Northern green bog orchid	Orchidaceae
Habenaria viridis	Bracted bog orchid	Orchidaceae
Hackelia jessicae	Jessica's stickseed	Boraginaceae
Hedysarum sulphurescens	Yellow hedysarum	Leguminosae
Heracleum lanatum	Cow parsnip	Umbelliferae
Heterotheca villosa	Golden aster	Compositae
Heuchera cylindrica	Sticky alumroot	Saxifragaceae

Scientific Name	Common name	Family
Heuchera richardsonii	Richardson's alumroot	Saxifragaceae
Lathyrus ochroleucus	Cream-coloured vetchling	Leguminosae
Lemna minor	Common duckweed	Lemnaceae
Lepidium densiflorum	Common pepper-grass	Cruciferae
Leptarrhena pyrolifolia	Leather-leaved saxifrage	Saxifragaceae
Lilium philadelphicum	Western wood lily	Liliaceae
Linum lewisii	Wild blue flax	Linaceae
Listera borealis	Northern twayblade	Orchidaceae
Lithospermum ruderale	Woolly gromwell	Boraginaceae
Lomatium dissectum	Mountain wild parsley	Umbelliferae
Lomatium macrocarpum	Long-fruited wild parsley	Umbelliferae
Lomatium triternatum	Wesern wild parsley	Umbelliferae
Lupinus sericeus	Silky perennial lupine	Leguminosae
Luzula parviflora	Small-flowered wood-rush	Juncaceae
Maianthemum canadense	Wild lily-of-the-valley	Liliaceae
Melilotus officinalis	Yellow sweet-clover	Leguminosae
Mentha arvensis	Wild mint	Labiatae
Mitella nuda	Bishop's-cap	Saxifragaceae
Monarda fistulosa	Wild bergamot	Labiatae
Monesis uniflora	One-flowered wintergreen	Pyrolaceae
Musineon divaricatum	Leafy musineon	Umbelliferae
Myosotis alpestris	Alpine forget-me-not	Boraginaceae
Orobanche uniflora	One-flowered cancer-root	Orobanchaceae
Orthilia secunda	One-sided wintergreen	Pyrolaceae
Osmorhiza chilensis	Blunt-fruited sweet cicely	Umbelliferae
Osmorhiza depauperata	Spreading sweet cicely	Umbelliferae
Osmorhiza occidentalis	Western sweet cicely	Umbelliferae
Oxytropis sericea	Early yellow locoweed	Leguminosae
Oxytropis splendens	Showy locoweed	Leguminosae
Pedicularis bracteosa	Western lousewort	Scrophulariaceae
Pedicularis groenlandica	Elephant's-head	Scrophulariaceae
Penstemon confertus	Yellow beardtongue	Scrophulariaceae
Penstemon eriantherus	Crested beardtongue	Scrophulariaceae
Penstemon lyallii	Large-flowered beardtongue	Scrophulariaceae
Phlox hoodii	Moss phlox	Polemoniaceae
Polemonium pulcherrimum	Showy Jacob's-ladder	Polemoniaceae

Scientific Name	Common name	Family
Polygonum amphibium	Water smartweed	Polygonaceae
Potentilla arguta	White cinquefoil	Rosaceae
Potentilla gracilis	Graceful cinquefoil	Rosaceae
Potentilla hippiana	Woolly cinquefoil	Rosaceae
Potentilla pensylvanica	Prairie cinquefoil	Rosaceae
Pyrola chlorantha	Greenish-flowered wintergreen	Pyrolaceae
Ranunculus acris	Tall buttercup	Ranunculaceae
Ranunculus cardiophyllus	Heart-leaved buttercup	Ranunculaceae
Ranunculus uncinatus	Hairy buttercup	Ranunculaceae
Rumex acetosa	Green sorrel	Polygonaceae
Sanicula marilandica	Snakeroot	Umbelliferae
Saxifraga bronchialis	Spotted saxifrage	Saxifragaceae
Saxifraga occidentalis	Rhomboid-leaved saxifrage	Saxifragaceae
Scirpus validus	Common great bulrush	Cyperaceae
Sedum stenopetalum	Narrow-petalled stonecrop	Crassulaceae
Selaginella densa	Prairie selaginella	Selaginaceae
Senecio canus	Prairie groundsel	Compositae
Senecio foetidus	Marsh butterweed	Compositae
Senecio integerrimus	Entire-leaved groundsel	Compositae
Senecio vulgaris	Common groundsel	Compositae
Sisyrinchium montanum	Blue-eyed grass	Iridaceae
Sium suave	Water parsnip	Umbelliferae
Smilacina racemosa	Falso Solomon's-seal	Liliaceae
Smilacina stellata	Star-flowered Solomon's-seal	Liliaceae
Solidago canadensis	Canada goldenrod	Compositae
Sparganium angustifolium	Narrow-leaved bur-reed	Sparganiaceae
Sparganium minimum	Slender bur-reed	Sparganiaceae
Spiranthes romanzoffiana	Hooded ladies'-tresses	Orchidaceae
Stenanthium occidentale	Bronzebells	Liliaceae
Streptopus amplexifolius	Clasping-leaved twisted-stalk	Liliaceae
Taraxacum officinale	Common dandelion	Compositae
Thalictrum occidentale	Western meadow rue	Ranunculaceae
Thalictrum venulosum	Veiny meadow rue	Ranunculaceae
Thermopsis rhombifolia	Golden bean	Leguminosae
Thlaspi arvense	Stinkweed	Cruciferae
Townsendia parryi	Parry's townsendia	Compositae

Scientific Name	Common name	Family
Tragopogon dubius	Common goat's beard	Compositae
Typha latifolia	Common cattail	Typhaceae
Urtica dioica	Common nettle	Urticaceae
Utricularia vulgaris	Common bladderwort	Lentibulariaceae
Valeriana dioica	Northern valerian	Valerianaceae
Veratrum eschscholtzii	Green false hellebore	Liliaceae
Veronica americana	American brooklime	Scrophulariaceae
Vicia americana	Wild vetch	Leguminosae
Viola adunca	Early blue violet	Violaceae
Viola canadense	Western Canada violet	Violaceae
Woodsia scopulina	Mountain woodsia	Polypodiaceae
Zigadenis elegans	White camas	Liliaceae
Zigadenis venenosus	Death camas	Liliaceae
Zizia aptera	Heart-leaved Alexanders	Umbelliferae
Shrubs:		
Acer glabrum	Mountain maple	Aceraceae
Alnus crispa	Green alder	Betulaceae
Alnus tenuifolia	River alder	Betulaceae
Amelanchier alnifolia	Saskatoon	Rosaceae
Arctostaphylos uva-ursi	Common bearberry	Ericaceae
Clematis occidentalis	Purple clematis	Ranunculaceae
Cornus stolonifera	Red-osier dogwood	Cornaceae
Elaeagnus commutata	Silverberry	Elaeagnaceae
Juniperus communis	Ground juniper	Cupressaceae
Juniperus horizontalis	Creeping juniper	Cupressaceae
Linnaea borealis	Twinflower	Caprifoliaceae
Lonicera dioica	Twining honeysuckle	Caprifoliaceae
Lonicera involucrata	Bracted honeysuckle	Caprifoliaceae
Potentilla fruticosa	Shrubby cinquefoil	Rosaceae
Prunus virginiana	Choke cherry	Rosaceae
Ribes inerme	Mountain gooseberry	Grossulariaceae
Ribes oxyacanthoides	Northern gooseberry	Grossulariaceae
Rosa acicularis	Prickly rose	Rosaceae
Rosa woodsii	Common wild rose	Rosaceae
Rubus idaeus	Wild red raspberry	Rosaceae
Rubus parviflorus	Thimbleberry	Rosaceae

Scientific Name	Common name	Family
Salix bebbiana	Beaked willow	Salicaceae
Salix lucida	Shining willow	Salicaceae
Salix maccalliana	Velvet-fruited willow	Salicaceae
Salix pseudomonticola	False mountain willow	Salicaceae
Sambucus racemosa	Red elderberry	Caprifoliaceae
Shepherdia canadensis	Canada buffaloberry	Elaeagnaceae
Spiraea betulifolia	White meadowsweet	Rosaceae
Symphoricarpos albus	Snowberry	Caprifoliaceae
Symphoricarpos occidentalis	Buckbrush/Snowberry	Caprifoliaceae
Vaccinium caespitosum	Dwarf bilberry	Ericaceae
Vaccinium membranaceum	Tall bilberry	Ericaceae
***Trees**:*		
Picea glauca	White spruce	Pinaceae
Pinus contorta	Lodgepole pine	Pinaceae
Pinus flexilis	Limber pine	Pinaceae
Pinus monticola	Western white pine	Pinaceae
Populus balsamifera	Balsam poplar	Salicaceae
Populus tremuloides	Aspen	Salicaceae
Pseudotsuga menziesii	Douglas-fir	Pinaceae

APPENDIX E. Comparison of native upland vegetation community types found in this study to other defined Montane community types.

Moisture/Nutrient regimes	This Study	Archibald et al (1996)	Willoughby et al (1998)
FOREST SITES			
Subxeric/Poor	Fd-Pf/rough fescue-Idaho fescue	Fd-Pf/juniper	Pf/rough fescue
Submesic/Poor	Fd-Pl/bearberry – juniper	Pf/bearberry-juniper	Pf-Fd/juniper-bearberry
Submesic/Medium	Fd-Sw/needle litter	Fd/needle litter	Fd/hairy wild rye
	Pl/needle litter	Pl/Canada buffalo-berry/hairy wild rye	Pl/buffaloberry/ pine grass
Mesic/Medium	Fd-Sw-Pl/white meadowsweet	Fd/white meadowsweet	Sw-Fd/ white meadowsweet
	Aw-Sw/ white meadowsweet	-----	Aw-Pb-Sw/ pine grass
	Sw/moss	Sw/feather moss	Sw/moss
Mesic/Rich	Aw/snowberry	Aw/saskatoon-snowberry	Aw/snowberry-saskatoon
	Aw-Fd/ snowberry/pine grass	Aw/pinegrass	Aw/rose/ pinegrass
	Fd-Sw/snowberry/ baneberry	Sw/thimbleberry	Sw/thimbleberry
Subhygric/Rich	Pb-Sw/snowberry	Pb/snowberry	Sw-Pb/snowberry
Hygric/Rich	Sw-Pb/river alder	Sw-Pb/horsetail	Sw-Aw/scouring rush
	Pb-Sw/horsetail	Sw-Pb/horsetail	Sw-Aw/scouring rush
	Sw/thimbleberry/ horsetail	Sw-Pb/horsetail	Sw/thimbleberry
SHRUBLANDS			
Mesic/Rich	Snowberry– rose / fireweed/Kentucky bluegrass	-----	Snowberry –rose-saskatoon / bearberry
GRASSLANDS			
Subxeric/Poor	Bluebunch wheat grass – Idaho fescue	-----	Bluebunch wheatgrass / sedge
Submesic/Medium	Parry oatgrass –rough fescue – Idaho fescue	-----	Idaho fescue – Parry oatgrass – rough fescue
Mesic/Rich	Rough fescue – Kentucky bluegrass	-----	Kentucky bluegrass – rough fescue

APPENDIX F. Ranking system used to evaluate status of significant plant species. The system was originally developed by The Nature Conservancy, and is presented in ANHIC (1996). Only the ranks for species discussed in this report are included here.

Rank	Definition
S1	Five or fewer occurrences or only a few remaining individuals or may be imperiled because some factor of its biology makes it especially vulnerable to extirpation.
S2	6-20 occurrences or with many individuals in fewer occurrences; or may be susceptible to extirpation because of some factor of its biology.
S3	21-100 occurrences, may be rare and local throughout its range, or in a restricted range (may be abundant in some locations or may be vulnerable to extirpation because of some factor of its biology).
S4	Typically >100 occurrences; may be rare in parts of its range, especially peripherally.
SU	Status uncertain often because of low search effort or cryptic nature of the element; possibly in peril

APPENDIX G. Definitions of risk categories at national (COSEWIC 1996) and provincial (Alberta Environmental Protection 1996) levels, which were used to evaluate status of fauna in the study area.

I. COSEWIC (Committee on the Status of Endangered Wildlife in Canada 1996) assigns wildlife species of concern one of the following categories:

Status	Definition
Extinct	A species that no longer exists
Extirpated	A species no longer existing in the wild in Canada, but occurring elsewhere
Endangered	A species facing imminent extirpation or extinction
Threatened	A species likely to become endangered if limiting factors are not reversed
Vulnerable	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events

II. Alberta Environmental Protection (1996) uses the following evaluation system:

Status	Definition
Red-listed	Populations of these species have declined, or are believed to have declined, to nonviable levels, or show a rate of decrease indicating that they are at immediate risk of declining to nonviable levels in Alberta
Blue-listed	These species are also at risk but the threats that they face are less immediate. This list includes species which are particularly vulnerable because of non-cyclical declines in population or habitat, or reductions in provincial distribution
Yellow A-listed	Yellow A-listed species are sensitive species which may require special management to address concerns related to naturally low populations, limited provincial distributions or life history features that make them vulnerable to human-related changes to the environment. Yellow A-listed species are those for which concern has been expressed over long-term declines in numbers.
Yellow B-listed	Yellow B-listed species are those which are naturally rare but not in decline, or are associated with habitats or habitat elements that may be deteriorating.